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Proceedings of the Royal Society of Medicine Vol. 45 1

Section of Anæsthetics

President—JOHN GILLIES, C.V.O., M.C., M.R.C.P.Ed., F.R.C.S.Ed., F.F.A. R.C.S.

[*September* 7, 1951]

Physiological Trespass in Anæsthesia[1]

PRESIDENT'S ADDRESS

By JOHN GILLIES, C.V.O., M.C., M.R.C.P.Ed., F.R.C.S.Ed., F.F.A. R.C.S.

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IN the evolution of methods of anæsthesia it was natural that unconsciousness and absence of reaction to surgical stimuli should for long be considered the primary objectives. The discoveries of Wells, Morton and Simpson had attained these at once, and had given an impetus to surgery. The time was not yet ripe for the fullest exploitation of the new opportunity, for the barrier of sepsis had still to be surmounted. With the introduction by Lister of the principle of antisepsis the way gradually became clear for surgical progress, especially for entry into the abdominal cavity and for development of abdominal operations. So far there had been little challenge to anæsthetists to produce anything more than insensitivity and oblivion. The need for the complete relaxation of muscles was not appreciated, though doubtless there were occasions similar to the one described in Lister's case records when "there was considerable difficulty with the anæsthetic and in placing the patient in the lithotomy position".

In the early and somewhat experimental years a justifiably circumspect attitude was maintained by those who administered anæsthetics, so that the complete pharmacological scope of ether, of chloroform or of chloride of ethyl was seldom explored except by inadvertence. Depressed respiration was then a danger zone to be avoided: respiratory arrest was interpreted as impending death. The original simple equipment for inhalational anæsthesia was useless to deal with difficulties of respiration; resuscitative measures were crude and much less effective than their modern counterparts.

Occasionally, fatalities occurred from gradual or cumulative overdosage, but, as far as they were reported, they seem to have been less common than others which happened abruptly, often in relation to a fearful patient, and were due to excessive liberation of adrenaline or to premature or severe surgical stimulus. In this latter group the quantity of anæsthetic given was usually noticeably small and by absolute standards sublethal. These two types of fatality had widely dissimilar mechanisms—in the first there was a progressive depression of the vital processes, the result of generalized cellular poisoning; in the second, a grave and rapid decline in circulatory and respiratory activity was associated with light rather than with deep anæsthesia. Within a restricted and non-fatal range these sequences are respectively the distinguishing features of the old and the new in anæsthetic procedure, although in the latter—now undergoing extensive clinical trial—the marked physiological derangements which occur are not reflex in origin but are contrived directly by curarization or by induced hypotension. Pharmacologists and most anæsthetists consider anæsthetic drugs to be poisons, and general anæsthesia to be a pathological state, especially when without adjuvants it is pushed to its limits to meet the needs of major surgery. Macintosh and Bannister (1947) support the general view that whereas natural sleep is a physiological state anæsthesia is pathological and any drug which produces unconsciousness with muscular flaccidity is a poison. On the other hand Harris (1951), following Quastel and Wheatley (1932), does not agree that narcotics act as tissue poisons on either unicellular or multicellular organisms; he excepts the halogenated hydrocarbons which, because of their chlorine radicals, are protoplasmic poisons likely to produce renal and hepatic damage and sometimes cardiac breakdown.

[1] Read at the 26th Annual Congress of Anæsthetists held at B.M.A. House, Tavistock Square, London, W.C.1.

In the early years of abdominal surgery, muscular relaxation was usually obtained by means of deep general anæsthesia, which satisfied the surgeon and had few detrimental effects if the operation was of short duration and the patient was not initially too ill. It is probably true, as Harris (1951) states, that in properly conducted anæsthesia the concentration of the agent in non-nervous tissues should always be below the minimal threshold concentration necessary to produce depression in the cells of the several areas of functional activity of the brain, and below a concentration which would precipitate any form of protoplasm. However, the metabolic and physiological disturbances associated with anæsthesia are related to the extent and duration of operative procedures; as these increased, the stress imposed on the patient by long-continued deep anæsthesia became a serious limiting factor to surgical advances. A disproportionate concern and an all-too-ready satisfaction with immediate operating conditions, especially with complete relaxation, outweighed the significance of the undesirable effects which so frequently followed such anæsthesia—a bias which may be still seen when inexperienced anæsthetists, young and not so young, are asked to provide optimal operating conditions by relatively complex means. In many clinics uncompensated depression of respiratory and circulatory functions, seen at its worst in third or fourth plane ether anæsthesia and regarded as ideal for abdominal surgery, became a routine, whilst its hardly avoidable continuance in the post-operative period was too seldom deprecated. In time the incidence of pulmonary and cardiovascular complications, often accompanied by less obvious but equally serious renal, hepatic and even cerebral dysfunction, indicated plainly the necessity of preventing or reducing these handicaps, or, alternatively, of abandoning general anæsthesia for less toxic methods. With inhalational anæsthesia patients were often taken far beyond the limits of reversible physiological abnormality and exhibited both local and general manifestations varying in their severity according to the drug used, its concentration and its duration of action. In retrospect it is surprising that so many surgeons for so long remained tolerant of factors so detrimental to their work. Some did not: and the shape of things to come was discernible in the work of Crile (1914) and of others who sought to avoid the side-actions and consequences of deep general anæsthesia by combining local analgesia with basal narcosis.

Other forms of regional analgesia, including subarachnoid block, had been available for some time: their advantages were generally admitted, but despite this, their adoption by clinicians was determined mainly by the availability or otherwise of sufficiently effective general anæsthesia. In certain American centres regional methods were employed on a significant scale because of their merits: this was not surprising in a land where the deliberate and time-consuming operative techniques developed by Halsted and Cushing would be handicapped by the general anæsthesia of that day. British surgeons and anæsthetists have shown little more than spasmodic interest, excepting a few enthusiasts, such as Dodd, McEvedy, James and Mansfield, who have taken trouble to develop and practise the complete techniques essential for success. In Continental Europe regional analgesia was preferred to the indifferent general anæsthesia which was available. It is an interesting surmise that lack of effective general anæsthesia and the consequent extensive development and application of regional methods may have contributed to the surgical advances made in the clinics of Finsterer, Kirschner, Sebrechts, Sauerbruch and many others.

In North America and Great Britain the emergence of specialists in anæsthetics and the introduction of new agents and of much improved equipment helped to delay the eclipse of full general anæsthesia as a means of providing for the greater and more discriminating demands of modern surgery and its exponents. Cyclopropane and closed apparatus embodying the principle of absorption of carbon dioxide brought inhalational anæsthesia to a higher peak of efficiency than before. Many faults of the older methods were eliminated, such as the loss of fluid by exhalation and the retention of carbon dioxide. Added advantages were the greater effectiveness in producing muscular relaxation and that complete control of the breathing which made a quiet field possible. Less toxic anæsthetics combined with refinement of absorption technique played an important part in the development of intrathoracic surgery, which, in turn, stimulated anæsthetic practice and helped to solve some of its important problems.

The introduction into clinical practice of certain soluble barbiturates which could be administered intravenously seemed at first to be the answer to the long search for a form of general anæsthesia which would be safe, effective, and free from complications. Certainly this new method satisfied the demand of most patients for a quick and not unpleasant transition to unconsciousness; but although satisfactory enough for minor surgical procedures, when used as the sole anæsthetic for major operations requiring deep anæsthesia for more than half an hour or so, it was soon found to have serious disadvantages. Applied to their maximal pharmacological limits, intravenous barbiturates are, like inhalational anæsthetics, unsuitable for prolonged and extensive operations because of the high price they exact from the patient.

The value of the discovery of general anæsthesia in 1846 was gradually lost. Despite certain notable technical improvements such as simplified tracheal intubation and "controlled respiration", general anæsthesia still carried too many detrimental side-effects for the advance of surgery to profit by its help. This was the stage reached when the introduction of curare changed the entire outlook.

What has just been said may be considered too severe an indictment of a once indispensable ally of surgery. Yet in submitting to operations involving vital functions directly or indirectly to an extent never before known, patients had enough to overcome on their way to recovery without the extra burden of the metabolic, respiratory and cardiovascular disturbances added by prolonged general anæsthesia. The opportunity had come for a revolution in anæsthetic procedure which would recover the early initiative, and would play a positive part in the prevention or mitigation of the physiological hazards accompanying modern surgical operations. It is paradoxical but true that such positive help is contrived by methods which trespass with apparent impunity far beyond the hitherto accepted limits of physiological derangement, and produce a profoundly altered but reversible physical state to which Hickman's historical term "suspended animation" may be applied more truly than he could have imagined.

In the techniques now being developed there is a trend away from general anæsthesia of pathological type to methods less toxic pharmacologically but notable for the liberties which they take with vital processes. These liberties or trespasses indicate a changed outlook upon the limits of physiological deviation permissible during anæsthesia, but their adoption and intelligent practice are justifiable because of the advantages they provide for both the patient and the operator. They concern apnœa, muscular paralysis and planned hypotension. Until a few years ago muscular paralysis was the only one of these likely to escape adverse or apprehensive comment; it had long been accepted as essential. The others are of recent origin and are still being investigated experimentally and clinically.

Apnœa

When volatile anæsthetics are employed respiratory tidal volume has heretofore been the primary guide to the arbitrary planes of anæsthesia. With ether particularly, progressive medullary depression was reflected in a directly proportionate diminution in depth of breathing, and the respiratory pattern associated with ether became recognized as a simple and reliable standard. Chloroform anæsthesia varied from this only in the faster rate with which medullary depression developed in relation to the onset of motor paralysis. It is not surprising that respiratory depression and arrest occurring during the administration of cyclopropane and thiopentone—agents with greater central than peripheral effects—were at first difficult to assess. Guedel (1934) had noted the possibility of turning apnœa to advantage by the administration of ether from closed apparatus which allowed the absorption of carbon dioxide; its purposeful production by that great pioneer, and later by Waters (1936) and Nosworthy (1941), was the first special application of a side-action of anæsthesia to facilitate surgical operations. With its dangers of paradoxical pulmonary activity and mediastinal displacement thoracotomy was a convenient field in which to exploit with advantage the suppression of spontaneous breathing. "Controlled respiration", ultimately achieved by interference with the chemical control of the respiratory centres, was a far-reaching technical advance based on a simple derangement of a physiological process. To produce an equivalent state by deep general anæsthesia would entail a grave degree of widespread cellular poisoning. At a later stage, the use of specific muscular relaxants enabled anæsthetists to provide, more easily and with less toxicity, optimal operating conditions in which gross physiological changes were effectively compensated.

The technique of "controlled respiration" devised to solve the difficulties attending thoracotomy brought new problems. When the pleural cavity is not opened, passive pulmonary ventilation, if overdone, may reduce both venous return and cardiac output, circulatory factors normally related to the mean intrapleural pressure which remain unaffected when the pleural cavity is widely opened. When the thoracic cavity is intact the application of positive intrapulmonary pressure makes the pressure in the pleural space less negative (that is relatively more positive) and this raises right auricular pressure which, in turn, retards cardiac filling and output. Under experimental conditions and without surgical interference this alteration in circulatory dynamics is quickly rectified by a compensatory rise in peripheral venous pressure; the gradient is restored and cardiac output becomes stabilized at its original level. Under clinical conditions, if hæmorrhage occurs or if sympathetic inhibition is present, reductions in venous pressure are not readily adjusted; in these circumstances positive-pressure breathing may cause further circulatory deterioration. Vasodilatation due to sympathetic paralysis can be reversed by vasopressor drugs, but without resort to them venous return can be increased by positioning, particularly when the blood volume remains normal. It is important to note that in operations such as thoracolumbar splanchnicectomy in which the pleura may be opened unintentionally, a small opening should be enlarged to make inflation of the lung easier and to prevent tension pneumothorax.

Whittenberger and Sarnoff (1950) have considered the merits and demerits of several methods of pulmonary inflation in relation to their effects on circulatory efficiency. Although there is much in this work that concerns anæsthetists it must suffice to refer only to electrophrenic respiration. This is a more physiological method of passive ventilation than the intermittent compression of an

anæsthetic reservoir bag or the negative pressure of a body respirator; by regularly induced contractions of the diaphragm the natural mechanism of breathing is activated independently of its chemical control through the respiratory centre and carotid body. My own experience of electrophrenic stimulation suggests its possible advantages in treating post-operative respiratory and circulatory depression of central origin; within the ranges of voltage and frequency so far employed electrical stimulation is not likely to be useful in dealing with peripheral respiratory failure due to an overdose of curare.

Lastly, there can be no place in clinical practice for "diffusion respiration", experimentally investigated by Draper and Whitehead (1944) and others, and, at times, unthinkingly permitted by some anæsthetists. Adequate pulmonary exchange is always essential for the patient's well-being; its spontaneous form is best. Electrophrenic stimulation may turn out to be a more effective second-best than the forms of artificial respiration now in use.

Muscular Relaxation

Brief reference has already been made to specific muscular relaxants and the part they play in the artificial control of breathing. In the further development of these agents it is possible that their secondary action on autonomic ganglia may be put to some useful purpose. Synthetic preparations may be discovered which will produce both muscular relaxation and hypotension. The desirability of this may well be doubted for, as in the ill-advised use of curare and thiopentone in common solution, modifications of the two major effects cannot be made independently. Apart from curarization, local and regional anæsthetics are still of particular value in paralysing muscles selectively, but with the exception of subarachnoid block they do not enter into this discussion. They cause relatively little local or general physiological disturbance. They do not avoid the possibility of psychological upset in the conscious patient and with safe basal narcosis available this risk is not worth taking.

Induced Hypotension

Most anæsthetists of my generation have had frequent occasion to worry about circulatory depression during surgery. The need for fluid replacement was not always properly understood; loss of blood was generally underestimated; its replacement was often too long delayed and inadequate. Nature did her best through the mechanism of vasoconstriction, but this alone without rapid restoration of blood volume led to reduced peripheral blood flow and to anoxia. Some anæsthetists have invoked the same crude mechanism of vasoconstriction by giving vasopressor drugs continuously; this practice may give a false impression that the circulation is more adequate than it really is. Beecher (1949) has clearly re-stated the problem of hæmorrhagic shock, and has emphasized the criteria for its proper assessment and management. By efficient maintenance of blood volume during operation the serious hazards that were formerly common might have been avoided and the need for a "hypotensive crusade" might not have arisen. However, after the introduction of cyclopropane, and especially when curare made deep general anæsthesia unnecessary, excessive bleeding became an increasingly troublesome feature in surgery. This was a serious matter for the patient and one which could impede the operator's work; it arose because of the limiting of the general anæsthetic and the persistence of reflex circulatory activity. Hence planned hypotension was developed as a necessary adjunct to anæsthesia.

In reducing a patient's blood pressure to a level significantly below normal the aim is to provide with safety a nearly bloodless field of operation, particularly where bleeding may otherwise be severe and difficult to control (e.g. in pelvic exenteration) or where even in small amount it may adversely affect precision of exposure and the ultimate result as in such operations as thoracolumbar sympathectomy, fenestration for otosclerosis and certain plastic procedures. Bleeding concerns the surgeon and anæsthetist: loss of blood concerns the patient.

The advantages of hypotension to the surgeon are obvious; his work is made easier and can be done more quickly. These and other benefits, particularly the conservation of a constant blood volume, accrue also to the patient so long as the hypotensive technique is competently controlled. The demands on the transfusion service are considerably lessened, a matter of importance should national emergency arise.

There are several methods of inducing hypotension:

(1) *General anæsthetics.*—If administered in sufficiently high concentration most general anæsthetics will cause progressive central depression and a fall in blood pressure. This was so even with the open method of administering ether and chloroform, the use of which has never been seriously criticized in respect of troublesome bleeding except when congestive or anoxic factors were present. Even with cyclopropane an ischæmic field can be produced when a deep plane of anæsthesia is reached.

(2) *Arteriotomy*.—As a means of lowering blood pressure and simultaneously reducing tension in cerebral aneurysms and tumours, arteriotomy has been of considerable value. Blood is withdrawn from the radial artery in amounts of up to two litres or more and the systolic pressure is reduced to 90 mm.Hg or lower, according to surgical requirements and to the patient's condition. As and when necessary, the blood is reinfused.

(3) *Total sympathetic paralysis*.—In the first exploitation of hypotension as a means of facilitating surgery, high spinal block was employed; its history goes back to the early years of this century when Vehrs, Koster, Le Filliatre and others practised this rather bold method. It is interesting to quote Pitkin (1928): "In those days (1912) we knew little or nothing about blood pressure changes and our only common concern was whether we had anæsthesia; we used to marvel at the fact that we had such nice dry wounds." The technique employed by these pioneers was truly total spinal anæsthesia and under it operations were performed on any part of the body, including the head. In its present form the procedure cannot be called total spinal anæsthesia, because of all the spinal fibres, only the sympathetic outflow is completely affected, the motor and sensory blocks extending only to levels adequate for the intended operation. Vehrs (1931), and later Sarnoff and Arrowood (1946), have shown that sympathetic paralysis can be obtained by a concentration of as low as 0·2% procaine; for spinal motor nerves a concentration of 1·5 to 2% is necessary. Because of this difference in susceptibility it is possible to produce total sympathetic block without at the same time paralysing the motor roots to the same level. In the proper application of the method, breathing remains spontaneous because most of the intercostal muscles and certainly the diaphragm are unaffected by the block. The duration of hypotension depends upon the drug injected and its dosage. Thus, procaine (150-200 mg.) is effective for 30–90 minutes; nupercaine (7·5–10 mg.) will provide an average of three hours' sympathetic paralysis. The possibility has been considered of maintaining hypotension for a long period by means of intermittent injections of procaine through an indwelling catheter, but the use of this procedure has been discouraged by reports of serious neurological complications.

(4) *Ganglionic blockade*.—This method of inducing hypotension has arisen from recent investigations into the treatment of essential hypertension by vasodilator drugs. Under certain conditions, the iodides and bromides of pentamethonium and hexamethonium have been shown to lower blood pressure, and they are employed for this purpose in anæsthetic practice. They are highly favoured because of ease of administration, applicability in a wide range of surgical operations and avoidance of the risks associated with subarachnoid block.

With the exception of arteriotomy, the techniques mentioned produce vasodilatation, a change which, in itself, is not normally sufficient to produce the marked hypotension expected or desired. Much depends on the posture of the patient which should be so arranged that transference of blood may take place by gravitation into dependent parts (particularly the lower limbs). The extent of the pooling which follows determines the reduction in venous return and the ultimate fall in blood pressure. By appropriate positioning the site of operation may be raised above the general level of the body, the local blood flow reduced and an ischæmic field provided.

It is vitally important that the blood of patients in a hypotensive state should be sufficiently well oxygenated to ensure an adequate supply of oxygen to the cells of the brain, liver and kidneys. Experience has shown that this can be done with a high degree of certainty. In contrast to the vasoconstriction which may accompany a reduction in blood volume due to hæmorrhage, in vasodilatation the blood flow is not affected disproportionately to metabolic requirements and anoxic changes do not follow periods of efficiently controlled hypotension. These generalizations are true as regards the effects of induced hypotension on cardiac and renal function. The presence of advanced sclerosis in arteries, particularly the coronaries, must obviously be a contra-indication to any form of induced hypotension, but so far no other has been proved.

The scope and comparative values of hypotensive techniques may be briefly stated as follows:

(1) *General anæsthesia alone*.—In the extensive major surgery of to-day, profound generalized cellular intoxication with all its consequences is too high a price to pay for hypotension or any other desirable operating condition. It is unjustifiable.

(2) *Arteriotomy* is probably more difficult to manage than either subarachnoid sympathetic paralysis or ganglionic blockade. The level of blood pressure which may be considered optimal in the interests of both patient and operator is hard to judge and the advantages of a normal blood volume are absent. By reducing blood flow associated compensatory vasoconstriction can cause anoxia, which may not be readily noticed and which, if prolonged, must prejudice a patient's recovery. The scope of the method is limited and may well shrink.

(3) *Spinal block*.—In addition to blocking the entire sympathetic outflow this method provides motor and sensory paralysis adequate for many operations. The necessary basal narcosis can be minimal and relatively non-toxic. Because of its comprehensive effects this technique has much

value in operations where muscular relaxation is essential; it would be difficult to justify its application in operations where the full effects of spinal anæsthesia are not needed, although this has been ignored in investigating its full range. It is worth remembering that in addition to preventing excessive bleeding, total sympathetic paralysis also prevents loss of fluid by perspiration.

(4) *Ganglionic blockade.*—This method may be applied more widely than the others. It is more easily carried out than is spinal block and does not carry the alleged dire risks of intrathecal injections. On the other hand, the accompanying narcosis must be on a relatively deep plane in order that motor and sensory paralysis may be adequate. This disadvantage can be obviated by giving a muscular relaxant in addition to the general anæsthetic; so used, however, the method becomes relatively complicated.

Conclusion

Total sympathetic block by spinal injection, and full autonomic blockade by the methonium compounds, are notable examples of physiological trespass in anæsthesia. They aim at providing some measure of control of the circulation, a logical sequel of other gross liberties with physiological processes such as the controlled respiration and the curarization introduced in recent years into anæsthetic practice. They are features of a well-developed trend in anæsthetic procedure in which general anæsthesia has been relegated to a minor and almost harmless role, whereas certain specific physiological deviations, not so long ago regarded as incompatible with life, have been extended and applied far beyond the old accepted limits of reversibility.

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Section of Obstetrics and Gynæcology

President—GILBERT I. STRACHAN, M.D., F.R.C P., F.R.C.S., F.R.C.O.G.

[*November* 23, 1951]

The Treatment of Menorrhagia

PRESIDENT'S ADDRESS

By GILBERT I. STRACHAN, M.D., F.R.C.P., F.R.C.S., F.R.C.O.G.

Professor of Obstetrics and Gynæcology in the University of Wales

THE condition of menorrhagia represents essentially bleeding from a non-malignant condition of the body of the uterus, and is a symptom of a variety of pelvic diseases which allows of a consideration of several different measures in its treatment.

The conditions with which menorrhagia may be associated as a symptom may be divided into two main groups. The first of these comprises cases in which some clinical causative lesion is present such as a fibromyoma, metropathia or endometriosis: while in the second group the condition of the pelvic organs is clinically normal, and this group includes the important condition of functional bleeding.

In the organic group uterine fibromyomata and uterine endometriomata represent two of the most important and most frequently encountered conditions. In a woman about 40 years of age who suffers from menorrhagia and in whom a palpable tumour with the characters of a fibromyoma is found, it is, I think, generally agreed that abdominal hysterectomy, whether total or subtotal, is the treatment of election. I cannot at all subscribe to the view that in a nulliparous patient the subtotal operation necessarily suffices and that total hysterectomy should be reserved for the parous woman with the damaged and infected cervix.

In favour of *subtotal hysterectomy* it is claimed that total hysterectomy is a more difficult and longer operation entailing a greater risk of injury to bladder or ureter; that the supports of the vaginal vault are removed, so that vaginal vault prolapse is likely to occur; that the risk of infection is greater as the vagina is opened; that shortening of the vagina is apt to follow; that the absence of the lubricating cervical secretions may produce subsequent dyspareunia; and that the risk of subsequent stump carcinoma is negligible.

My personal experience fails to substantiate any one of these objections. In the hands of trained pelvic surgeons total hysterectomy should take no longer than the subtotal operation and should be associated with no extra risk of sepsis or damage to the urinary organs. Again I have no knowledge of shortening of the vagina, of subsequent dyspareunia or of vaginal vault prolapse although we take no steps, such as anchoring the round ligaments to the vagina, to prevent the last mentioned. Spencer (1932) was a protagonist of total hysterectomy. In 325 of these operations he had a mortality of 1·8%. In his cases 4 had undiagnosed carcinoma of the cervix and 2 undiagnosed carcinoma of the body. This view is supported by Cuthbert Lockyer (1924). Read and Bell (1933), reviewing the Chelsea Hospital results in 2,344 cases of hysterectomy from 1922 to 1931, found that 75% had been subtotal and 25% total, but Kimbell in 1950 found that in the Samaritan Hospital 2,569 of the hysterectomies were total, while 910 (26%) were subtotal. Again, the Mayo Clinic figures (quoted by Kimbell) of 6,262 hysterectomies performed between 1937 and 1945 show that about 23% were subtotal and 77% total. These figures present a complete reversal of the earlier ones and would appear to indicate that the total operation is nowadays being much more frequently performed.

My personal records for the last ten years comprise 523 hysterectomies for fibromyomata and for endometriosis. Of these 430 were total operations while 93 (17·7%) were subtotal. In the course of these 523 operations both appendages were removed in 419 cases, the appendages on one side were removed in 72 cases, while in 32 cases all ovarian tissue was conserved.

Mortality: The earlier figures of Read and Bell show about 1% higher mortality with the total operation, but Kimbell and the Mayo Clinic show approximately the same mortality after each operation, the figures indeed being just slightly in favour of total hysterectomy which can be regarded today as carrying a risk of 1 to 1·5%. The combined mortality in my series was 1·7% but with the total operations the mortality was 1·2% and with the subtotal operations 2·3%. The higher mortality associated with subtotal hysterectomy is probably because this operation was performed in the most difficult cases. The disadvantages of the subtotal operation are that it tends to hold up discharges, adhesions are more common, while post-operative ileus is more frequent. But the main disadvantage is the risk of subsequent carcinoma developing in the cervical stump. The term "stump carcinoma" is reserved for those cases in which carcinoma develops in the stump of the cervix two years or longer after subtotal hysterectomy. Should it develop within two years it is regarded as having been present at the time of the subtotal operation but undiagnosed.

The actual frequency with which carcinoma of the cervix develops after subtotal hysterectomy cannot be known. We can only know the frequency with which stump carcinoma occurs in a series of cases of carcinoma of the cervix. Thus Gagey found 36 stump carcinomas in 1,108 cases of cervical carcinoma, 3·43%. In von Graff's series (quoted by Spencer) of 215 cases of carcinoma of the cervix 17 (8%) were stump carcinomas, while Donnelly and Bauld (1949) found 40 stump carcinomas in 780 carcinomas of the cervix (5·12%), and Polak (1920) in 900 collected cases found cervical carcinoma in 2% and undiagnosed carcinoma of the body in 1%.

In Cardiff, out of 1,520 cervical carcinomas 31 occurred in the stump. 4 of these were coincident, occurring within one year of hysterectomy, and 27 (1·7%) were true stump growths. 2 of these occurred in nulliparous patients and one was unmarried. Peham and Amreich (1930), considering the figures for the general population of Hamburg, concluded that the stump was 27 times more liable to carcinoma than when the uterus was present, while Spencer claims that 3% of subtotal hysterectomies are followed by stump carcinoma, although it is not clear how he reaches these figures.

Again, apart from carcinoma, the cervix, especially if infected, forms a focus of vaginal discharge and pelvic discomfort. Read and Bell report persistent cervicitis in 20 out of 1,739 subtotal operations with subsequent fibroid formation in the cervix in one case, and we have had a similar example of this latter complication.

With a fat patient, unsatisfactory anæsthesia, a small tumour, a deep pelvis and in the presence of adhesions such as are encountered along with endometriosis one may have to be content with a subtotal operation owing to operative difficulties.

The fate of the ovaries.—If the appendages are inflamed and adherent or if the ovaries are occupied by chocolate cysts they should be removed as their retention is likely to be followed by pelvic pain. But, if the ovaries are healthy, some would leave them in order that endocrine function may be retained, while others advise removal in order to avoid the possibility of subsequent disease and because, after removal of the uterus, the ovaries tend to atrophy within a variable period.

I have seen 2 cases of carcinoma in ovaries which were not removed at hysterectomy, while Hendry (1936) reported 33 operations in nine years for pathological conditions of ovaries conserved during hysterectomy. 29 of these were simple cysts while 2 were sarcomata and two granulosa-cell tumours. There is a definite risk, therefore, of subsequent tumour formation. Again, Crossen (1947) is strongly in favour of removing the ovaries, and indeed he regards this as an important procedure in the prevention of cancer, while Novak (1951) states that when hysterectomy is performed in menopausal or post-menopausal women it is false conservation to retain the ovaries as it has never been shown that they have any function after the menopause.

The matter of endocrine withdrawal and the occurrence of menopausal symptoms such as flushings and sexual frigidity are very difficult to determine. In an investigation now proceeding in Cardiff the replies to enquiries regarding them often tend to be hesitant and contradictory as if the woman were considering the matter for the first time.

McLaren of Birmingham (1941) in a small series of cases found moderate or severe flushings in 46·5% of patients in whom all ovarian tissue had been removed at hysterectomy and in only 1·5% of cases where ovarian tissue was left. N. A. Richards (1951) investigating 312 cases found hot flushes after 27% of hysterectomies where both ovaries had been conserved, 52% where one ovary had been removed and in 98% where both ovaries were removed, but in 59 cases of total ovarian removal reported by Latto (1951) severe flushings occurred in only 15 cases (25·5%). It is difficult to account for the enormous variations in the reported incidence of this symptom except by variations in psychological reaction and in methods of investigation.

Age is an important factor in this connexion and I can see no object in retaining ovaries after the age of 40, the time of life when most fibroids are encountered, when they are, in any case, likely to atrophy at the approaching menopause. An important point after removal of ovaries is whether the patient knows that this has been done, and my experience is that if the patient is unaware of the fact that she has been castrated there is no probability of such symptoms supervening.

The opportunity of making hysterectomy preventive of further trouble should never be neglected, and if a total operation with removal of both appendages be performed, the woman is rendered safe for life so far as intrapelvic disease is concerned.

Vaginal hysterectomy does not permit of an extensive exploration of the pelvis. It is employed mainly when a small fibroid or a condition of metropathia is present in association with an advanced degree of prolapse. A fibroid palpable above the pubis is usually too large for removal by the vaginal route while, if the vagina is narrow or the uterus anchored, as in endometriosis or by parametrial infiltration, the technical difficulties of the operation are formidable and the risk of hæmorrhage or damage to the bladder or ureter are not slight.

Myomectomy is a conservative operation particularly indicated in patients under the age of 40 and especially under 35 in whom the retention of the uterus and of the menstrual function is important; but the proportion of women with fibroids at these ages is relatively small. It has no place in the treatment of endometriosis.

Against the operation it has been held that bleeding is greater and more difficult to control than in hysterectomy; but with a proper technique this should not be the case. Thus, Bonney (1946) in 806 myomectomies had a mortality of 1·1%, about the same as for hysterectomy, while Munnell and Martin (1951) had only one death in 236 cases.

A graver objection is that fibroid seedlings, unnoticed at the time of operation, may continue to grow and so to reproduce the original condition, with the necessity for further treatment. In Bonney's series this occurred in 9 out of 622 cases (1·4%) and six of these required hysterectomy; but Whitehouse (1935) puts the risk of recurrence at 10%, while Munnell and Martin (1951) report 12·3% of 236 cases requiring further operation. Bonney considers that the risk of recurrence is less after the age of 35 as fibroids are mostly "laid down" before then.

Again, menorrhagia, due to persistence of endometrial hyperplasia, may persist after myomectomy and this may call for subsequent radiotherapy or even hysterectomy. In Bonney's cases this occurred only seven times (1·1%) but Whitehouse found this state of affairs in 20% of his cases. Bonney's good results in this respect may be influenced by his practice of curetting the uterus through the myomectomy incision. But Leith Murray (1930) reports that persistence of menorrhagia is usually temporary, lasting only a few months until involution of the enlarged uterus is completed.

Authorities differ widely regarding the probability of future pregnancy. Thus, Munnell and Martin (1951) record 26% of pregnancies following myomectomy, Bonney 38% and Rubin (1942) 25 to 35%. But pregnancy occurs not infrequently in the presence of fibroids and a proportion of the pregnancies reported would probably have occurred apart from myomectomy.

The operation, therefore, is to be regarded as of limited applicability. Lockyer performed the operation in 35 out of 545 cases (6·5%) with fibroids and this represents my own experience.

Metropathia hæmorrhagica is a condition of uncertain pathology, characterized by some degree of hyperplasia both of the endometrium and of the myometrium and commonly associated with a follicular cystic condition of the ovaries. To this state of affairs the name of metritis has been given and this represents an early stage of the condition. As time goes on the endometrium tends to atrophy and many of the uterine muscular fibres are replaced by connective tissue, so that the uterus ceases to be bulky, it becomes of a generally hard consistence while curettage demonstrates very scanty endometrium and in some cases no endometrium. This condition has been called fibrosis uteri and in both these stages menorrhagia represents the main symptom and may be very profuse and debilitating.

"Menopausal bleeding" is a term unfortunately attached. While bleeding may occur from this condition, and from others, such as fibroids or carcinoma, about the age of 45 when the menopause would normally be in sight, I know of no association other than accidental, between these organic lesions and the menopause, and in my opinion, there is no such condition as menopausal bleeding. In the absence of an organic lesion menstruation simply ceases, gradually or suddenly, usually without any untoward menstrual disturbance. There is so much superstition associated with the menopause that it is important not to add to it in this way.

My practice in these cases is first of all to perform dilatation and curettage. This excludes the possibility of carcinoma of the body and demonstrates the character of the endometrium. If the latter is hypertrophic, curettage alone will cure, at least temporarily, some 20 to 25% of cases and so may suffice in the case of a patient who is unwilling to lose the function of menstruation.

Foulkes (1949) actually reports 47% of cures with curettage alone in 169 patients with functional bleeding in later menstrual life. He states that the older the patient the more likely the cure by curettage alone, but in my experience the important factor in this respect is the character of the endometrium.

But in the majority of these cases, and in all cases with scanty endometrium, curettage alone will not suffice to relieve symptoms, and my practice in cases of this sort is to insert a 50 mg. tube of radium for forty-eight hours into the uterine cavity in order to bring about an artificial menopause.

McLaren (1950), in a careful investigation of 118 patients up to two years after intrauterine irradiation, found serious flushings in 50% of these, many of them of long duration. But the Council of the Medical Women's Federation (1933) found an incidence of menopausal flushing in 62·3% of 1,000 normal cases investigated. These figures, therefore, do not show any aggravation of this symptom as the result of radiotherapy. Latto (1951), however, found severe flushes in only 26% of 100 cases treated by radium, while Mary Gilmour (1949) states that hot flushes are not a more prominent feature after radiotherapy than in the normal menopause and should not be regarded as a complication following radium. This represents my own view.

Sexual frigidity, according to McLaren, also occurs in 50% of cases after radiotherapy but this complication is not mentioned by Latto.

Recurrence of bleeding occurred in 14% of Latto's cases and of these 5 cases called for hysterectomy. The most common cause of this is an undiagnosed small submucous fibroid which may later become polypoid and even extrude through the cervix.

Persistent discharge, backache, vulvitis and joint pains are other complications that have been described following radium: but the first of these is due to persistent cervicitis which should have been treated by cauterization, while the others are not significant.

An important sequel is carcinoma of the body of the uterus following radium. If this appears within eighteen months of irradiation it has to be regarded as having been overlooked at the time of operation. I have had experience of two examples of this sequel (Strachan, 1936) in over 1,000 cases, and Mary Gilmour has encountered 7 out of 2,050 cases treated by radium but 2 of these occurred within sixteen months of irradiation and so were not true sequelæ. Similar figures have been reported by other observers but in many of the series reported it has not occurred.

Carcinoma of the body is essentially a disease of the post-menopausal period and it has yet to be shown that it is predisposed to by previous radiotherapy, although Corscaden and Gusberg (1947) reported 9 cases of this condition and 6 cases of cervical carcinoma following treatment by radium in 958 patients. They conclude that the liability to carcinoma of the uterus is increased three to four times by previous radiotherapy. So far as I know, carcinoma of the cervix has not been reported by other observers as a sequel to radiotherapy and it is difficult to see how it can be causative in this respect.

The alternative treatment to radiotherapy in these cases is hysterectomy. Although my experience of radiotherapy in these cases is so satisfactory I do not hesitate to perform hysterectomy if, for any reason, I think the result with radium is likely to be unsatisfactory. Thus in 1,084 of these cases treated by myself in the last ten years radium has been employed in 943 while 141 (13%) have been subjected to hysterectomy.

Radium therapy in the treatment of these non-malignant hæmorrhages in late menstrual life is satisfactory in my experience. Recurrence of bleeding in 3% of cases with the necessity for hysterectomy in 1% represent the main complications that we meet in a minor operation with almost no mortality and short convalescence. Follow-up figures are not yet complete, but so far they support our previous impression that severe flushings and sexual frigidity have been infrequently encountered.

Functional menorrhagia occurring in young women. Menorrhagia in older women has been considered when discussing metropathia hæmorrhagica. This condition, which is generally regarded as due to hyperœstrinization with deficient luteinization of the endometrium, may occur at the menarche or in early menstrual life and may be of all degrees of severity.

It represents, therefore, a deficient correlation of endocrine action in which not only the anterior pituitary and the ovaries may be involved, but also the thyroid. The tendency is for this correlation to adjust itself and for the symptom to clear up in the course of time. This may render the assessment of any particular therapeutic measure difficult, and may also explain why a diversity of treatments can each claim a measure of success.

Exploratory curettage is necessary in order to determine the condition of the endometrium and to exclude any pathological lesion, which, however, is not so likely to be present in these cases as in older women, although Sutherland (1950) found unsuspected tuberculosis in 10 cases out of 1,000 which he investigated. It is said that curettage alone will cure up to 25% of these cases but this is not our experience.

The use of progesterone alone has not proved satisfactory, but, in conjunction with œstrone, it has been found of real benefit. To-day, treatment consists usually of the administration of relatively large doses of œstrone. This may appear surprising when it is remembered that the condition is due to hyperœstrinization of the endometrium but Karnaky (quoted by Sutherland) explains this by showing that at a particular œstrogenic blood level constriction of the spiral arteries of the endometrium occurs and leads to subsequent necrosis of the superficial endometrium so that uterine hæmorrhage follows. But if the œstrogenic blood level is too high or too low, bleeding will not occur and it is, therefore, the object of œstrone therapy to raise the blood œstrone level above the threshold of hæmorrhage in that particular patient. Treatment divides itself into two phases: the immediate control of the bleeding and the prevention of subsequent menorrhagia.

In the former case Sutherland advises administration of the anti-menorrhagic factor. This has to be administered in doses of two capsules daily and continued without interruption for variable periods in order to avoid relapses.

Œstrogenic treatment is usually the treatment of choice and in appropriate dosage should control the bleeding within twenty-four to forty-eight hours. Up to 5 mg. of stilbœstrol daily (Swyer, 1950) usually suffices for this, but in some cases toxic symptoms, such as sickness, prove troublesome. If necessary this dose can be increased or even doubled, and the treatment should be continued for twenty days in order to avoid withdrawal hæmorrhage. Bishop (1949), on account of the toxic effects of stilbœstrol, advises ethinyl œstradiol in doses of 0·25 mg. two-hourly until bleeding ceases, when this dose should be maintained daily for seven days. In this way the immediate bleeding can usually be controlled. An attempt must now be made to regulate the cycle and for this Swyer advises administration of 2 mg. of stilbœstrol daily beginning on the fifth day of the withdrawal bleeding and continued for twenty days, and this is repeated at the next period. In the following period 20 mg. of ethisterone is added daily by mouth and continued for ten days. In the subsequent periods the stilbœstrol is reduced and the ethisterone is increased in amount.

By measures such as this the symptom can usually be controlled and a relatively large number of cures are reported. But it will be noted how tedious a course of treatment such as has been indicated may be, and many good results are vitiated by the patient abandoning treatment, possibly after the acute hæmorrhage has been controlled. The tendency has therefore been for the treatment of these cases to be referred to specialized endocrinologists and to be lost to the clinical gynæcologist.

Treatment by androgens has been found inconclusive, while thyroid employed empirically has been credited with some success. Again, Blaikley (1949) has lately emphasized the importance of the psychological aspect of this matter and he has pointed out the frequency with which psychiatric treatment effects a cure. This may be one factor in the proportion of these cases which are cured by simple curettage.

While much progress has been made in the treatment of these functional bleedings by the administration of endocrines in the manner indicated, the high hopes of the early workers have not been realized and it has to be admitted that the treatment of a case of severe functional bleeding in a young woman may still represent one of the most formidable problems that we encounter.

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Section of Epidemiology and State Medicine

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DISCUSSION ON THE EPIDEMIOLOGY OF TUBERCULOSIS

Dr. Marc Daniels: When planning a programme of tuberculosis control, the needs in the tuberculosis services must be assessed, and hitherto assessment of needs has been based on the number of deaths. Recently, however, estimates on this basis have become very inadequate.

The number of patients needing treatment has not declined with the number of deaths. In 1939 the ratio of deaths to new notifications was 0·55—in 1949 0·38. Now this is partly because early treatable cases are being discovered more efficiently than before, so that even if there were a real decrease in morbidity, it might be hidden by the additional cases detected by case-finding schemes. But it is possible also that there has been no real decrease in morbidity, even and particularly during the past few years of progress in chemotherapy. Many patients who before the streptomycin era would have died within one, two or three years are now alive, but with persistent active lesions, fruitful sources of infection for others.

Because of these changes we must measure the tuberculosis problem now in terms of prevalence, not mortality. I propose then to review some of the evidence from recent studies which have given us indications of the prevalence of tuberculous infection and disease in this country.

Prevalence of infection.—It is not artificial to separate this from morbidity, though the two should be studied together. Prevalence of infection, as gauged by tuberculin tests, is simply a measure of exposure in the community; prevalence of tuberculous disease is a measure of the combined effect of exposure and lack of resistance at some time following exposure.

Much of our thinking and planning in tuberculosis control is based on the old assumption that tuberculous infection in Europe is universal and inevitable, i.e. that by the time we reach adult age we are all infected. Surveys in recent years, however, have shown that this is no longer true. In examining recent surveys I shall refer only to those where the test was completed to 100 Tuberculin Units.

In 1949, following proposals from the British Tuberculosis Association Research Committee, the M.R.C. organized a tuberculin survey in 22 representative areas of England and Wales. The results have been analysed in 3 main geographical groups: rural areas in England and Wales, urban areas in Southern England, urban areas in other parts of England and Wales. At school ages the percentage of children positive was lowest in the urban areas of Southern England, and highest in rural areas. At ages 5–6, the proportion positive was under 10% in four of the six South urban areas; it was over 20% in five of the seven rural areas. After the age of 15 the percentage positive is highest in North urban areas: at ages 19–20 73% there are positive; 64% in rural areas, and 59% in South urban areas; these figures are well below those found for the same age-group in the Prophit Survey between 1934 and 1943, when 80 to 85% were positive.

It is interesting, in view of the striking difference between urban and rural areas in the M.R.C. survey, to see the results obtained in a recent survey (Burke, P. J. (1951) *Brit. med. J.* (ii), 887) in County Sligo, Eire. The difference was reversed: at ages 6–10, 20% of children in urban areas, and only 10% of children in rural areas, were tuberculin positive; at ages 11–15, 33% of children in urban areas were positive, 12% in rural areas.

The data we have concerning the prevalence of tuberculosis in herds in different areas, and the proportion of raw milk retailed in those areas, leaves little doubt that the high percentage of tuberculin positives in young children of rural England is due to infection from tuberculous milk. In an M.R.C. survey of non-pulmonary tuberculosis in England and Wales, 1943 to 1945, tubercle bacilli were

isolated and typed from nearly 1,000 patients suffering from non-pulmonary tuberculosis. In England 26% of the strains isolated were bovine; in children under 15 the proportion was 40%, the proportion being highest in the 5–9 age-group—thus indicating that much infection may have originated from unpasteurized milk supplied to schools. In Wales the proportion of bovine infections is lower than in England. There is a much higher proportion of cattle in attested herds in Wales than in England. The authors conclude . . ."the solemn truth is that, omitting pulmonary tuberculosis, about 1,300 persons are dying in England each year from a preventable disease. There is every reason to believe that if all milk for human consumption throughout the country could be adequately heat-treated, tuberculosis of bovine origin would be practically abolished."

The finding that infection, mainly from bovine sources, occurs more widely in rural children than in urban, is sometimes linked with the observation that the tuberculosis death-rate is generally lower in rural areas than in urban, and the conclusion is drawn that the lower death-rate in rural areas is due to protection developed following infection from bovine sources. The conclusion is not justifiable, for several reasons. *First*, the urban death-rate in adults may be higher because infection risks are greater for adults in towns than in the country. *Secondly*, even if infection rates are as high in rural adults as in urban, more of the cases developing will be non-pulmonary, with the result that (*a*) there will be a lower death-rate from pulmonary tuberculosis, and (*b*) there will be a lower death-rate from tuberculosis all forms, since non-pulmonary has a lower fatality than pulmonary tuberculosis. None of this signifies *protection* by bovine infection. *Thirdly*, since 1900 the urban tuberculosis mortality in this country has always been higher than the rural; but "safe" milk has only been widely available in the towns in relatively recent times. Also, in France, where milk is never drunk raw, we find the same difference in tuberculosis death-rates in town and country.

Unfortunately, bovine infection in childhood is still considered by some as a beneficial process, bestowing some degree of immunity when the children reach adult life. But in the U.S.A. bovine tuberculosis has been virtually eradicated, and in some States the proportion of young people *un*infected at the age of 20 is as high as 90%, and the tuberculosis death-rate has continued to decline without interruption.

Some of the recent surveys have given us information on attack rates of infection, or the number of uninfected persons who show tuberculin conversion in one year. The Prophit Survey showed very high rates of infection in nurses—80% and 54% in two groups of London hospitals. Ball and his co-workers showed that, in a hospital where tuberculosis was treated as an infectious disease, where proper precautions were taken, the infection rate was 28% for nurses.

The data of the M.R.C. Tuberculin Survey indicate probable infection rates in children and adolescents. Between the ages of 5 and 14 the annual infection rate is 5%, and between the ages of 15 and 20 it is 10%—the figure is higher than this in Northern cities, lower in rural areas. These infection rates in young adults are probably lower than ten years ago, and it would be false to assume that they give a permanent measure of the infection to which young people must perforce be exposed.

When we turn from the infection levels and rates to the morbidity or prevalence of disease in this country, we find the information more difficult to assess.

The total of persons on the clinic registers does not measure exactly the total of known cases of tuberculosis in the country; some cases do not appear on the registers, and on the other hand names still appearing in the register totals of some clinics are of patients long since recovered or dead. The total, 272,000, at the end of 1949, does, despite the limitation, indicate the size of the problem. At the end of 1939, it was just under 189,000—some 83,000 cases less. What does this mean? Figures elicited recently by Dr. J. E. Geddes in Birmingham support the view that this increase in the case total is not due solely to the addition of minimal cases discovered by case-finding schemes; it is also due to increased survival. Geddes states that the survivorship after five years was 23% for cases notified in 1935 and 1940, and 57% for the 1945 cases, a difference much greater than could be accounted for by a difference in type of case (in so far as this is measurable by sputum positivity alone). Taking the difference between 23% survival and 57%, this means that 34% of the cases notified in 1945, who on previous expectations would have died within the five years and thus disappeared from the case register, now still appear on that register. It seems likely then that the increased totals represent, at least in part, a real increase in the prevalence of cases of tuberculosis at any single time.

The Sickness Survey, which was conducted in 1946–47 by the Social Survey, C.O.I., showed that out of 69,163 persons aged 16 and over the tuberculosis rate was 277 per 100,000 on any single day. Applied to the whole population of England and Wales, this means that nearly 95,000 persons over the age of 15 are ill with tuberculosis on any single day.

Mass radiography gives a measure of cases not revealed by these statistics. The figures given by the Ministry of Health in 1950 show that up to the end of 1949, a total of nearly 4 million persons had

been examined. Previously unsuspected active tuberculosis of the lungs was revealed in 3·8 per 1,000. The combined mass-radiography figures for this country have greater statistical value than for most other countries, since here teams are centrally trained, have fairly uniform techniques, and fairly similar standards of reading films. The Ministry of Health figures are nevertheless difficult to interpret; they do not tell us in how many cases the examination was a first one, in how many a re-examination, nor how many were the results of genuine community surveys, where an attempt was made to examine a whole group, and how many were the results of special case-finding schemes in contacts, suspects referred by general practitioners and so on. This is obviously important—the same Ministry of Health report tells us that tuberculosis was diagnosed in 4% of contacts examined—compare this with the figure of 4 per 1,000 for general mass-radiography results. We must conclude then that it would be very difficult to use mass-radiography figures as they stand for any study of trends, or differences between areas—though certainly the mass-radiography units are performing very useful functions. and the figures give us an idea of the problem as a whole.

Turning now to attack rates, the number of new notifications in 1949 was just over 52,000 (1·2 per 1,000)—some 6,000 more than in 1939. This does not necessarily signify increased morbidity, and the increase could be wholly due to improved case-finding. The increase was solely in notifications of pulmonary tuberculosis; over the same period there was a marked drop in notifications of non-pulmonary tuberculosis, and this must be related to the increasing availability of safe milk in towns. If we analyse the notifications by age-groups and by sex, some interesting facts emerge. Up to the age of 15 they are about the same in both sexes. Above the age of 15, the rates of non-pulmonary tuberculosis are consistently higher in females than in males, in each age-group. The rates of pulmonary tuberculosis are highest in the 15–24 group, and in that group higher in females than in males. But from the age of 25 on, the rate in females falls rapidly, in the same way as the death-rate; the rate for males falls much more slowly, and is then considerably higher than the female rate; but it *does* decline, and this is very different from what happens to the *death*-rate in males, which continues to rise to a peak at the ages of 50 to 60. This concords with findings reported recently by Dr. Springett in respect of re-examinations by mass-radiography. He analysed the results of repeat mass-radiography of over 31,000 persons the result of whose previous examination had been normal, and, with data on the interval of time elapsing between the two examinations, was able to calculate annual attack rates of morbidity in different age-groups, in men and women. The rates for women were 3·5 per 1,000 at 15–24 years; 2 per 1,000 at 25–34; 0·5 per 1,000 over 34; for men, 3 per 1,000 at 15–24; 2 per 1,000 at 25–34; 1 per 1,000 at 45–59. These are low estimates, since cases developing symptomatically are not included. But the trends through the age-groups and in the two sexes are the same as those shown by the notification rates. Springett comments on the paradox, in males, of a falling *attack* rate with increasing age, and a rising *death*-rate, with a peak occurring late in life—at 60 years of age the death-rate is nearly double that in young adults; and he suggests that a considerable proportion of the fatalities in later life are the results of the breakdown of lesions probably acquired many years previously.

The Prophit Survey provides much useful information on the nature of tuberculosis morbidity in adults. In those tuberculin negative on entry to the Survey, there was a high morbidity in the year following primary infection, considerably higher than in persons tuberculin positive on entry. We cannot conclude that this difference was due solely to acquired immunity; those tuberculin positive on entry were a selected population, in that the susceptible ones who had succumbed to primary infection were excluded. It must be stressed also that the morbidity in the positives, those who had acquired a first infection at some time, perhaps many years, previously, was not negligible. In fact, 58% of the morbidity which arose in the young people of the Survey was in those who were already tuberculin positive on entry—did not arise, that is, within a short time following primary infection. Probably that proportion would now be lower; with increasing numbers of young people reaching adult age uninfected, an increasing *proportion of cases* in adults will arise following a primary infection. This does not signify that there will be an increasing *total of cases* arising in adults. A well-organized programme of tuberculosis control aims at reduction of infection in adults as in children—and when such a programme is pursued intensively, as for instance in Minnesota, it reaches a stage when it matters little that large numbers of adults lack a specific immunity which might protect them if they were infected.

I must apologize for what has been mainly a review of yardsticks, and the measurements of prevalence they give. I have not touched on the fundamental environmental factors, other than exposure, which may affect prevalence of disease by raising or reducing resistance to infection. But it is important that we should know how to use the yardsticks—that we should know their value and their limitations. The assessments of morbidity prevalence, applied to any area, will reveal a problem of formidable size—but there is no doubt the information should be obtained. These methods must be used if each tuberculosis authority is to pursue its proper aim of reducing the dissemination of tuberculosis to vanishing point, by protecting those especially exposed and by bringing under control and providing adequate treatment for every case of tuberculosis until cured.

Dr. Alice Stewart (Institute of Social Medicine, Oxford): *The Epidemiology of Tuberculosis in Industry.*

Since the epidemiology of tuberculosis is determined partly by infection and partly by resistance to the disease a *comprehensive* study of tuberculosis in relation to environment would need to take account of both these factors. No claim to comprehensiveness is put forward for the two investigations described below. In both these studies the main object has been to study the passage of infection between fellow workers, and from one household to another. This concentration on infection rather than on resistance was not so much a deliberate choice as dictated by the material available.

The starting point of the first investigation was in 1947, when C. M. Smith published the result of a mass radiography survey in Northamptonshire, which showed that the number of cases of newly discovered active tuberculosis amongst boot and shoe workers was almost twice as great as amongst men of comparable age in other trades in the County. This finding led us to make a more detailed investigation of tuberculosis in the shoe trade, in the course of which the following records were studied:

(i) The Registrar-General's decennial statistics of occupational mortality since 1891. In recent years these have distinguished between factory and non-factory workers.

(ii) The original records of the Mass Radiography Unit which examined workers in Northamptonshire. This unit X-rayed approximately 18,000 workers in the shoe industry and 24,000 workers in other industries during the years 1945–46.

(iii) Tuberculosis notifications in Northampton County Borough and Northamptonshire from 1940–49. These records were considered in relation to occupation and place of residence.

(iv) Health Visitors' reports on the housing conditions of tuberculosis notifications in Northampton County Borough between 1940 and 1949.

(v) Information supplied to the Board of Trade showing the working population of every shoe factory for each year of the war.

(vi) The medical records of men called up for National Service in Northamptonshire and Leicestershire between 1939 and 1945. These included a note on the occupation of the recruits.

(vii) Special reports of local factory inspectors for the Board of Trade Working Party (1946). These included the results of a survey of the working condition in 114 boot and shoe factories in Northamptonshire (cleanliness of the workshops, ventilation, lighting arrangements and spacing of operatives, &c.).

In addition to drawing on these sources of information we ourselves collected further data on:

(i) The level of bacterial contamination of the air in a sample of 36 boot and shoe factories in Northamptonshire and Leicestershire of various types and sizes.

(ii) The extent to which shoe workers, as compared with other workers, were exposed to infection from other members of their family. Also how far shoemaking was a family trade, i.e. what proportion of shoemakers, as compared with workers in other trades, had parents who were also in the shoe trade.

(iii) The exact place of work (in most cases the actual workshop in the factory) of every shoe worker notified with tuberculosis in Northamptonshire between 1940 and 1949.

(iv) The number of workers in each workshop divided according to sex and occupational subgroup (i.e. clicker, closer, finisher, &c.).

(v) The floor space per worker in each workshop.

From this miscellaneous collection of data it has been possible to draw some fairly definite conclusions. The relatively high incidence of tuberculosis among shoe workers has been confirmed and it has been shown that this is not due solely to poor living conditions, or to the fact that workers are recruited from families with tuberculosis. When, however, physique of shoemakers from Northamptonshire and Leicestershire (as recorded in the Civilian Medical Board registers during the last war) was compared with that of other workers it was found that a significantly lower proportion of shoe workers was placed in Grade I. Furthermore, the number of previously notified cases, as shown by (*a*) the Mass Radiography Survey of 1945–46 and (*b*) the questioning of a random selection of shoe workers and other workers (1947–48), showed in both cases a significantly greater proportion of these cases amongst male workers in the shoe trade than elsewhere.

This last fact might account for the high death-rate in the trade as a whole, but not for the marked differences within the trade (e.g. in 1931 the Standardised Mortality Ratio for pulmonary tuberculosis was 188 for shoemakers working in factories and 131 for makers and repairers. In 1945–46 the incidence of newly discovered active cases of pulmonary tuberculosis (revealed by mass radiography) was 10·1 per 1,000 in factories with more than 600 workers, and 3·1 in factories with less than 100 workers). Our investigations have shown that it is the *distribution* of men with chronic phthisis—often unrecognized as such—which is the vital factor in accounting for the different rates as between factory and non-factory workers and large and small factories.

It is obvious that the chance of one or more carriers of any infectious disease being found in a workshop—and therefore the chance of infection being transmitted between fellow workers—will increase with an increase in the size of the working unit. But during an influenza epidemic, for instance, carriers are likely to be found even in very small workshops, and therefore the case incidence is unlikely to be closely related to size of working unit. In the case of tuberculosis, however, where the number of infectious persons in the community is always relatively small, the risk of a carrier being present in a group of workers increases steadily with an increase in the size of the group. In fact, we have found that the incidence of tuberculosis in a particular workshop is directly proportional to the chance that one or more of the workers in this room is a carrier, which is in turn related to the number of workers. Thus, during the period 1940–49 there was four times as much tuberculosis in the largest boot and shoe workshops (those with 300–400 workers) as there was in the smallest (with 10–15 workers), where the incidence was no greater than in the general population.

After this important—and unexpected—positive correlation had been established, the possible influences of overcrowding and generally unhygienic working conditions were also investigated. It was found that bacterial contamination of the air (as shown in air samples) was heavier in those workshops where the distance between workers was below the average for the industry as a whole. On the other hand, no correlation was found between spacing of workers and tuberculosis incidence. The mass radiography findings for large and small factories were also examined in relation to a general assessment of the hygienic standards of Northamptonshire boot and shoe factories, surveyed by Home Office Inspectors in 1946. In these factories the only significant factor determining tuberculosis rates was size, though the "new" case incidence was very slightly higher in the large (or small) substandard factories than in the large (or small) Grade I factories. It would appear, therefore, that though factory hygiene may have a general effect on the health of factory workers, it is not of primary importance in the spread of tuberculosis. For this the decisive factor is the distribution of the chronic male carriers who, unless they are detected by mass radiography, may continue working for years, oblivious of the fact that they are a source of danger to others.

It is not claimed that every case of tuberculosis among shoe workers is contracted at work. Nevertheless, we have, from a statistical analysis of our data, worked out an estimate of the proportion of cases where the source of infection was probably at work and the proportion which can be accounted for under other headings. In the case of the largest boot and shoe factories it is estimated that approximately 60 per cent of the cases notified between 1940 and 1949 were contracted at work; the corresponding figure for the whole industry being about 40%, while cases resulting from home contacts with the disease were in the region of 25% of the total. It would be interesting to find out to what extent infection at work influences tuberculosis rates in other industries, but we have as yet had no opportunity to explore other trades.

We did, however, continue our study of tuberculosis in Northampton from the point of view of housing. In this second investigation a detailed study of all tuberculosis notifications in the town between 1921 and 1948 was undertaken to try to find out whether, for a family living next door to another family with tuberculosis, there was an increased risk of contracting the disease. To do this we noted for 3,346 cases of tuberculosis the date and the address at the time of notification. No attempt was made to study the possibility of infection between houses on opposite sides of the same street: but by concentrating on the distribution of cases on the same side of a street it was possible to discover whether a greater number of cases was occurring in next-door pairs of houses than would have been expected if the cases had been randomly distributed. In making the necessary calculations allowance was made for the differences between good, fair and poor houses. The possibility that members of next-door households were blood relations was also considered, but it was not possible to follow up the consequences of change of address after notification.

The results of this investigation showed that (i) the actual number of cases in next-door pairs of "notified" houses was significantly greater than the number expected if the distribution had been due to chance; (ii) for any period up to twelve years the number of cases occurring in the same and next-door pairs of houses exceeded the expected number by a significant amount; (iii) there was no evidence that the findings had been influenced by an excess of related persons in next-door houses.

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Section of General Practice

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[*October* 17, 1951]

DISCUSSION: AN OCCASIONAL OBSTETRICIAN

Dr. G. F. Abercrombie: An Occasional Obstetrician may be defined as one who, though by no means averse from specialist advice or assistance, is nevertheless prepared, himself, to perform all the ordinary obstetric manœuvres, except cæsarean section; and who, on an average and over a large number of years, attends a confinement once a month. I shall limit my observations to the last weeks of pregnancy and to the delivery itself, and I shall summarize my own results in private practice from July 1924 to July 1951. In particular, I should like to divide these results between the primigravida and the multipara, to analyse the incidence of forceps or other assisted delivery, and finally to assess the significance of so-called post-maturity, as it presents itself to a general practitioner. In 249 deliveries, 120 children were first-born, and the others (130) include one pair of twins (*see* Fig. 1).

So far I have not lost a mother in labour or as the result of it, but two of these confinements, one a placenta prævia, the other a perfectly normal labour, were followed by pulmonary complications of the most alarming kind, and three other patients had post-partum hæmorrhage so severe that immediate blood transfusion was required. The most hazardous moment of the whole of pregnancy is when the birth is actually over. The uterus, unless carefully guarded, gradually and insidiously becomes distended with blood. The uterus does not bleed because the patient has had an occipito-posterior or a forceps delivery; it bleeds because the placenta is loose, and the attendant is not attending! On the other hand, I have lost 4 children: first-born, 3 of 120 = 2·5%: others, 1 of 130 = 0·77%. Infants are lost at birth either from lack of care, or from lack of skill, or from lack of knowledge. The following case illustrates the first cause: in 1925, a primigravida, after a tedious fifty-hour labour, was finally delivered by a consultant, for whom I gave the anæsthetic, of an occipito-posterior, face to pubes. The moment he was gone, I discovered to my horror that a hot-water bottle had been left in the cot. The baby was badly burned and died in a week. This lesson, brutally severe to a novice at the beginning of his practice, has never been forgotten.

The lives of several other children have been in jeopardy. I have had at least one bad fright after the use of morphia, and I regard the cord round the neck as the greatest unforeseeable hazard of the present day. There has been only one breech delivery among the first-born. The mother was 35 years of age and her husband 64, and I was invited by an elderly colleague to see her when she was a day or two overdue, but not in labour. External version even with anæsthesia failed, and my suggestion of cæsarean section was not accepted. Fortunately, the membranes lasted nearly forty hours, but not until another sixteen hours had passed did it seem timely to assist. The baby, an eight-pounder, was none the worse. This complication is avoidable. In about 20 to 25% of cases, a breech presentation can be recognized at some stage, and, if carefully watched, can always be corrected to a vertex as the chance of spontaneous version recedes. If on any given occasion from the 30th week onwards I think I can turn easily, I leave it alone; but when I feel that, if left any longer, I may fail without an anæsthetic, I turn at once. The result is that I have only one other breech delivery to record, and that in a multipara whom I never saw until she was well on in labour: 2 of 250 = 0·8%.

KEY.—Each square represents a baby. The central date-carrying column separates 120 first-born on the left from 130 others on the right, all arranged in chronological order from below upwards and from the centre outwards.

First-born and others:

- Stillbirth or neonatal death.
- Persistent occipito-posterior or transverse arrest.
- Surgical induction.
- Breech delivery.
- Cæsarean section.
- Forceps extraction.

First-born only:

- Premature rupture of membranes.
- Mother 30 years old or more.
- Mother 35 years old or more.
- Baby 8 lb. or over.
- Baby 9 lb. or more.
- Labour 24 hours or more.
- Labour 36 hours or more.
- Labour 8 days overdue or more.
- Labour 15 days overdue or more.

Fig. 1

Multiparæ

Cæsarean section has been done thrice in multiparæ, one of whom had a placenta prævia, the other two a "Bad obstetric history". In spite of the label "Bad obstetric history" I believe that a large number of multiparæ would have normal confinements, instead of sections, if they were allowed to go into labour. It is very surprising to me how seldom forceps delivery is required in a multipara, and only once or twice have I known the labour last more than twenty-four hours. I have been compelled to deliver with forceps only three times—once in a woman who had rather alarming fits in the second stage, once for antepartum hæmorrhage, and once for simple delay in a doctor's wife, whom with more experience I think I could have managed better. In a fourth case, I was employed simply to watch the patient and to summon her consultant at the right moment. This I did, and he put on forceps as soon as he arrived. In all, then, 1 Breech, 3 Cæsareans and 4 Forceps in 130 deliveries, and my Assisted Delivery Rate in the Multipara is about 6%: I suppose the optimum would be about 3%, with a fœtal mortality in a large series of perhaps 1%. The only child lost to me was the very last of all, a concealed accidental hæmorrhage six weeks before term. I, therefore, approach the multipara with almost absolute confidence, some of which I hope I am able to inspire in her. I cannot think much help is to be obtained from exercises, either before or in the first stage of labour, and indeed in these days most housewives have enough to do already.

Primigravidæ

In what percentage of primigravidæ will the best obstetric help and care FAIL to accomplish normal spontaneous delivery? We can get a broad hint from the histories of these multiparæ, for I find that of the 75 who had their first confinement elsewhere, 6 (8%) lost their baby, and 25, i.e. 1 in 3, were delivered by forceps. Of my 7 primigravidæ submitted to cæsarean section, one had a severe toxæmia, but the other 6, 2 of whom were over 40 years of age, were either rescued from, or spared, a prolonged first stage, almost certainly to be followed by a forceps operation, possibly damaging. I suggest that delay in the first stage, or the fear of it, with the added risk to the child, is nowadays the chief indication for cæsarean section. The primigravida, in my hands at any rate, is an entirely different undertaking from the multipara. Not until after the war did I succeed in persuading more than half a dozen consecutive cases to deliver themselves spontaneously, and the only longish run is 11. On the other hand, of 16 primigravidæ in 1930 and 1931, only 5 delivered themselves. In 1929, I lost a baby and have hated the forceps operation ever since. After nearly two days and nights in the first stage, the membranes ruptured. Gas and oxygen was not well taken and she vomited. It was obvious that spontaneous delivery of what proved to be a 9-lb. baby was beyond hope, and I therefore performed an ordinary low forceps operation with the head absolutely central, the cervix effaced and the fœtal heart-rate 140. When the child was born, the cord was pulseless, the heart-beat absent, the sphincter relaxed, and meconium passed freely. A post-mortem showed a tear of the tentorium with hæmorrhage above and below, and that baby was lost through lack of skill.

I now never use axis traction rods and I never screw the blades together. Instead I grasp the handles of an old-fashioned pair of Wagstaffe's forceps in my right hand with the thumb and first three fingers only, and I put the tip of the little finger between the extremities of the handles. When traction is made, the blades come together and the handles come together. The pain experienced in the little finger gives me some idea of what is going on between the blades, and when that pain becomes severe, I think it wise to desist and wait a little. The indication for forceps is invariably the same—delay in the second stage, usually with the head on the perineum, but occasionally in the transverse or nearly so, and I never intervene unless I am quite sure that the efforts already being made will not succeed.

In the first 60 cases, there were 22 forceps and 1 cæsarean; in the second 60, 10 forceps and 6 cæsareans. I doubt whether this indicates any success in the pursuit of normal labour, but it does illustrate the tendency to substitute cæsarean section for long labours ending in forceps deliveries. My Assisted Delivery Rate in the Primigravida, made up of the solitary Breech, 7 Cæsareans, and 32 Forceps extractions, is 33%. I would advise any young practitioner to keep an eye on the cæsarean section rate plus the stillbirth rate plus the neonatal death-rate, all added together. If this figure, in the primigravida, is less than 10%, he is doing fairly well; if it is less than 7·5%, he is doing very well indeed, provided that the total fœtal mortality is not more than 2%. Professor Dugald Baird (*Lancet*, 1947, ii, 532) wrote to six leading men in large provincial cities, and asked for details of their private patients. In 1,633 first confinements, including 74 cæsarean sections, i.e. 4·5% of the whole, these men had 28 stillbirths and 21 neonatal deaths, a fœtal mortality of 3%, of which only one-sixth was attributed to deformity. I wish I knew how many times they used forceps!

As to anæsthesia, certainly it is an advantage no longer to have to use chloroform, which seemed to bring expulsive efforts altogether to a standstill, but too often to-day, unless the anæsthetist is very highly skilled, the patient loses sight of the object of the exercise, which is to have a baby, and is more than content simply to have an anæsthetic.

Of the 7 persistent occipito-posteriors or transverse arrests, all were delivered by forceps, in contrast to the 5 similar cases in multiparæ, who all delivered themselves. I cannot pretend to say how many O.P.s, other than those face to pubes, have occurred in this practice, for I have not the skill to separate them from those cases of minor disproportion which engage from the beginning in the transverse, but of one thing I AM certain: it is a mistake either to blame or to bully the uterus, which, like other well-known characters, is doing its best. Pitocin by intravenous drip is not yet suitable for general practice. There are some who hold that it is unjustifiable to deliver or to permit delivery face to pubes. I fancy that forward rotation by hand is neither as easy nor as successful as they would have us believe. When I encounter difficulty, I quickly abandon the attempt and deliver slowly face to pubes. Farquhar Murray's suggestion, to treat potential cases by a single Braist's pad at the 36th week, is interesting. Premature rupture of the membranes, as an initial sign of an occipito-posterior, seems to me less common than I was taught. The late Sir Henry Simson used to say, "If

the baby is not born within two hours of rupture of the membranes, something is wrong, and it is your business to find out what it is". He did not mean that immediate action is required, but that it is vital to know the situation when the membranes rupture, and to be alive to lack of progress thereafter. I am out of sympathy with those who teach a student to put his finger in the rectum, when all the information he wants is in the vagina. I should like here to ask what positive action, if any, can be taken when the membranes rupture early and the position is O.P. Short of cæsarean section, there seems nothing to do but wait. If the membranes rupture early (36 of 120 = 30%) nearly half the patients—17 of 36 = 46%—need help; if they rupture normally, help is needed only for one in four—23 of 84 = 27%.

Of the 28 primiparæ who were 30 years old or over, 17, or 60%, required assistance; of the 12 who were over 35, 9 required assistance; of those below 30, 23 of 92, only 25%. 39 of the 120 first-born, nearly 33%, weighed 8 lb. or over; among the 130 others, perhaps 50%. Of the bigger first-born, about half, 18 of 39, had to be assisted; of the smaller, 22 of 81, 27%. These last two factors, age of mother and weight of baby, though significant, are not, I think, the most important. Of 25 mothers in labour twenty-four hours or more, 17 (68%) were assisted, and of the 15 in labour more than thirty-six hours, only one succeeded in delivering herself. On the other hand, if 6 cæsareans be excluded, of 89 mothers in labour less than twenty-four hours, only 17, just under 1 in 5, were delivered by forceps. I think that anyone who persuades 75% or more of an unselected series of primigravidæ to deliver themselves is doing extraordinarily good work, provided that his fœtal mortality is not above 2%. Shall we put the optimum Assisted Delivery Rate at 25%, *i.e.* 5% cæsarean, 20% forceps?

Surgical Induction

Surgical induction for disproportion is to me unthinkable in general practice. As long as the membranes are intact, we may be reasonably sure that all is well; when they are gone, we are not so sure. My dislike of premature rupture has led me to avoid surgical induction, if possible. Only two primigravidæ have been so treated, both for toxæmia. The first was very severe and ended in a stillbirth, more than six weeks premature, with an infarcted placenta—a stillbirth due to want of knowledge. The treatment of the other was entirely successful. Among multiparæ, there were 4 surgical inductions, I because the presenting part was extraordinarily unstable following a Gilliam's operation, the other 3, much against my own inclination, for what is called post-maturity. Prematurity is really quite uncommon among my patients—only 6 first-born infants and 3 others weighed 5½ lb. or less. Post-maturity, however, seems to me the most controversial subject in obstetrics to-day. A. J. Wrigley states: "Let us forbid the administration of a full medical induction unless the indications for induction are such that its failure automatically necessitates a surgical induction" (*Proc. R. Soc. Med.*, 1946, **39**, 569). In my series there are 32 first-born eight days late or more.

It is generally believed that the child may die in the uterus, and apparently without warning, simply from post-maturity, and we are advised to induce labour whenever the patient is a week or more overdue. I have never done this in the primigravida, and if I were to do so, about 25% of all cases under my care would have to be induced. I had a patient who was twenty days late with her first child, fifteen days late with her second, and eighteen days late with her third—but induction was not considered necessary. I am not convinced that, in the absence of disease such as toxæmia or hæmorrhage, the child may die *in utero* without warning. In difficult labour, the fœtus fights for life, and we usually receive ample warning of the outcome of the struggle. I should therefore expect that, placental insufficiency being in theory a slow and gradual process, the fœtus would fight for its life in the same way, and that, if observed from day to day, some indication would appear in the fœtal heart sounds. What is badly needed is a series of careful observations on patients whose pregnancy is prolonged, but who are not being irritated by castor oil, hot baths, enemata and injections of pitocin. H. R. MacLennan (*Brit. med. J.*, 1950, ii, 800) says: "The longer pregnancy continues past the expected date the larger the child may become, the harder the head, the less easy the moulding, and the more difficult the ultimate confinement." He does not say it DOES happen, he only says it MAY happen. I have already demonstrated that difficulty in the primigravida is considerably increased when the membranes rupture early, when the mother is elderly, when the baby is big, and particularly when labour is prolonged. But I have no evidence of a like increase when pregnancy is prolonged. My Assisted Delivery Rate for all first-born was 33%. Of the 32 infants, eight days late or more, 31% were assisted, and of the 9 who were fifteen days late or more, 7 were normal spontaneous deliveries, the remaining 2 cæsarean sections. Small though these figures are, they suggest that neither the risk to the child nor the difficulty of the confinement is increased by post-maturity and indeed it may be that Nature deliberately delays labour until the baby is big enough, and its head hard enough, to stand the strain. I shudder to think what would have happened if these 32 patients had all had their membranes ruptured to start labour! I believe that, until far better evidence is accumulated, general practitioners would be wise to school themselves and their patients to ignore post-maturity altogether.

Summary

Here then is the completed picture of the primigravida. Though premature birth is quite uncommon, and breech delivery has been almost abolished, the fœtal mortality, 2·5%, is still unhappily too high. In about 5% of labours rotation of the occiput to the front is so long delayed that intervention is inevitable. If the membranes rupture early or the baby is big, the extraction rate rises from an average of 1 in 3 to 1 in 2. If the mother is elderly or more than twenty-four hours in labour, the extraction rate rises still further from 1 in 3 to approximately 2 in 3. In post-maturity, no rise appears, and surgical induction is considered unnecessary except for toxæmia. With good fortune and good facilities, the forceps rate might fall to 20% with cæsarean section at 5%.

No one nowadays does this work unless he is keenly interested in it. I hope therefore that the Occasional Obstetrician will no longer be regarded as the lowest form of gynæcological life, a position which should be exclusively reserved for those who DO antenatal work but DO NOT attend confinements. Finally I should like to see a change in the attitude of those who control the maternity wards of hospitals. Most of my work has

been done in houses, flats or nursing homes, and I have been fortunate. But how stimulating, and how beneficial, and in a critical case how much safer it would be, to supervise one's own patient in a theatre where every help is at hand when it is most needed. That ideal may be far away in the future, but meanwhile which hospital in London is going to be the first to open its doors in emergency to the Occasional Obstetrician?

Mr. F. N. Reynolds: *Damage by forceps.*—I do not think Dr. Abercrombie's forceps rate in primigravidæ is excessive, nor do I consider that a forceps rate is in itself any indication of good or bad obstetrics. There are too many other factors to be considered, though I do not for a moment advocate the free use of forceps in the absence of proper indications. It is, also, easy for a comparatively small series of cases to contain a disproportionate number in whom forceps are required, thus giving a false result. I would rather have a high forceps rate than a high percentage of post-partum hæmorrhages, the result of hanging on too long and getting a tired uterus. It is extremely difficult to apply forceps without causing a certain amount of damage, and a very careful examination of cervix and vagina must always be made so that lacerations can be adequately repaired. I think that his forceps method might well lead to an increased risk of damage to the fœtal head. If the handles are locked, the head is encircled by the blades; if unlocked, the blades might slip, causing increased pressure between their extremities.

Post-partum hæmorrhage.—I readily agree that post-partum hæmorrhage often occurs while the doctor is attending to the baby and forgetting the uterus. If I can avoid it, I never allow anyone to touch the uterus during the third stage, except myself, and whenever possible I sit with my hand on the fundus, noticing the behaviour and applying stimulation as and when required. So often, gentle pressure downwards produces a gush of blood indicating that the placenta is separating and the uterus is filling up. Gentle stimulation with the tips of the fingers at this stage will avoid what so easily can become quite a severe loss which is much more difficult to combat. It must be remembered that frequent or severe stimulation can produce a colicky action of the uterus, resulting in irregular placental separation, often ensuing in a retained placenta.

Pitocin before delivery.—It was always taught until recently that oxytocic drugs should not be used before delivery of the placenta, and until much more recently midwives were not allowed to use them, even in the face of a desperate hæmorrhage. This latter rule has now been altered. There is no doubt whatever that it is better for a midwife to give ergometrine, or better still pitocin, than to try to compete with a situation which may end fatally so quickly. I always use pitocin myself and give a dose of 2½ units directly I am ready to allow the head to be born. This procedure reduces considerably the average amount lost per patient, and leads to a comfortable, easy delivery of the placenta within a reasonable time. One talks about the uterus needing a rest upon completion of the second stage. The uterus seems to be waiting for the normal stimulus (the nature of which we are in entire ignorance) to come into play and re-start uterine contractions. During this interval, the artificial stimulation by pitocin maintains uterine tone.

Cord round neck.—The cord round the neck is such a common complication, if one can call it that, as to be almost normal, and provided one's first action on delivering the head is to feel for the cord, it very rarely gives rise to any difficulty. I have been able to find only 4 cases of this nature—1 in which a very short cord only a few inches long prevented delivery, and 3 in which several turns of the cord round the neck necessitated its division before the baby could be comfortably delivered. Cord round the neck is very rarely a cause of stillbirth. If a post-mortem were performed, as it should be, upon every case of stillbirth, there would be very few in which the findings would be asphyxia from this cause.

Breech presentation is extremely common at some time or another during pregnancy, but it is becoming less and less common as the presentation at delivery, since it is generally agreed that the risk of version is less than the risk of a breech delivery. I believe version should be carried out when one first notices the breech presentation somewhere after the 28th week. It is so easy to do, sitting alongside and talking to the patient, without her even knowing what is going on. It is true that the earlier a version is carried out, the more chance there is of a breech presentation recurring; but, on the other hand, it is difficult to know how long to wait for spontaneous version to occur. The great majority undergo spontaneous version before the 36th week, but round about that time, in a primipara, descent of the presenting part into the pelvis takes place and once the breech has descended into the pelvis, version becomes much more difficult. It is, too, the breech with extended legs which descends early.

Risks of version.—Version carries with it a certain amount of risk, and the later the version the greater the risk of partial separation of the placenta or, more rarely, of the baby passing through a loop of the cord and a true knot occurring, which very, very rarely becomes tight enough to cause fœtal death. Version without an anæsthetic is safer than with one, since the amount of force that can be used is controlled by the reactions of the patient. I believe a breech delivery should be avoided if it is at all possible, especially in a primipara; though if it becomes inevitable, there is no need to subject the patient to a cæsarean section solely on this account. Section for breech presentation should be reserved for those cases in which there are additional factors concerned, such as the age of the mother, disproportion and, in fact, anything which would still further increase the risks to the baby, and for those cases where a dead baby would be an irretrievable loss. I certainly do not agree with the practice of subjecting a young girl of, say, 20 years, to cæsarean section simply and solely on account of a breech. A breech is not always avoidable: there are those cases in which version is impossible—a fat patient, extended legs, little liquor—so that even in the early stages one fails.

Anæsthesia.—If one is entirely on one's own, I think chloroform, with all its disadvantages, still remains the method of choice, and if given by means of a Junker's Inhaler, one can produce first-class results in all but the occasional very difficult patient who goes completely "berserk" directly she receives the minimum of anæsthesia, and for whom there is no half-way house—she must be either completely *compos mentis* or completely

anæsthetized. For many years, I used a wide-bore Junker's Inhaler with the bellows attached by a tube sufficiently long to drop on the floor, where I could press the bellows with my foot. This left the nurse free to hold the mask with one hand and, say, a leg with the other, and, in this way, I have carried out many scores of confinements without trouble or difficulty.

Chloroform, nevertheless, is not the anæsthetic of choice since it does damp down the uterine contractions, and may even stop them altogether, as exemplified in a case I attended only a few weeks ago where the doctor gave chloroform on a mask when the head was just showing. I had to wait two and a half hours before the contractions returned, and during that time one was naturally anxious regarding both mother and baby.

The anæsthetist must be obstetrically minded or obstetrically trained. It is no use for him to sit behind the patient's head giving an anæsthetic. In my younger days, I used to give anæsthetics for confinements with Henry Simson. I always arranged a looking-glass so that I could see the perineum while I was giving the chloroform, and after a few months we could conduct a delivery without a word being said on either side. In expert hands gas and oxygen, with a little trilene or chloroform to follow on when needed, is the ideal method for actual delivery, apart from the earlier stages when analgesics rather than anæsthetics are required.

Occipito-posterior position.—I believe that it is unjustifiable and unnecessary to deliver face to pubes. One does, occasionally, come across a multiparous patient with a very capacious outlet, who delivers herself in this manner without any trouble. Apart from this, I cannot see the point in delivering an occipito-posterior as such, knowing that however the manœuvre is carried out the largest diameter of the fœtal head has to pass through the bony and soft outlet, and this cannot happen without more damage to the mother and possibly to the baby, than would otherwise occur. Manual rotation is possible in every case except those which have been left to become almost obstructed, when immediate delivery is the only means of saving the baby. The trouble encountered over this complication is due to the fact that it is not discovered early enough. There are always some points in the labour which should make one suspicious that the occiput is posterior and not rotating. There may be a somewhat prolonged first stage; then, following full dilatation, descent of the head is very slow, especially in the primipara, while in the multipara the head more commonly descends a certain distance—perhaps far enough to be seen—followed by an interval without any appreciable progress. If, after two hours in the second stage in a primipara, or one hour in a multipara, but even earlier if possible, satisfactory progress is not occurring, it certainly is our business to find out why not, and in 95% of cases an occipito-posterior position will be discovered. I would not trust myself to make the diagnosis always by defining one or other fontanelle.

More often than not, some anæsthesia is required to enable one to feel comfortably for the ear and, having done so, to avoid the pitfall of the folded-over helix, when one can be absolutely certain of the exact position of the head. Now, unless this examination has been left too late, the head is simply sitting in the cavity of the pelvis and has not yet entered the outlet. This is the stage when manual rotation should be carried out. The head will rotate in the pelvic cavity and there is no need at all to push it above the brim. I have never failed to rotate a head, though some gave more difficulty than others, and I believe that the reason difficulty or defeat is experienced is often due to the omission of a complete examination beforehand, to make quite certain whether the back is to the right or to the left; otherwise it is easy to attempt rotation the wrong way, and one cannot easily convert an L.O.P. to an R.O.A.

It has been argued with me that there can be more danger or more damage caused by manual rotation than by forceps delivery, face to pubes. Careful rotation with one's hand is most unlikely to cause any damage, unless the operator allows himself to get rattled and scrabbles around in a frantic manner because he does not succeed straight away in correcting this complication. Furthermore, it is not by any means a *sine qua non* that manual rotation must be followed by forceps delivery. If, having carried out rotation, the uterine contractions are satisfactory, leave things alone for five to ten minutes. In the multipara, by this time, delivery will probably have taken place, and in the primipara there will be obvious signs of the head descending. Sometimes, however, complete rotation has not been effected or the malposition has recurred, probably because the shoulders have not also rotated. If satisfactory progress, therefore, has not taken place after a reasonable interval and with satisfactory contractions, re-examine. If it is found that the occipito-posterior position has recurred, rotate the head again, making quite certain that the occiput really is anterior, and place the left-hand blade of the forceps in position and leave it there to allow a reasonable chance of spontaneous delivery.

Buist's pads.—I have had little luck with Buist's pads and I doubt if they are ever very effective, or, indeed, whether they are necessary.

Deep transverse arrest.—This term is comparatively modern and it is spoken of as though it were some new and fearsome complication. The fact is, however, that the condition should be looked upon merely as a transition stage between an anterior and a posterior position of the occiput. The treatment is exactly the same—manual rotation—and is no more difficult than if the occiput is completely posterior. Of course, I am speaking only of those cases in which no other complication is present. It is a very different matter if one is dealing with some form of disproportion.

I cannot see that any positive action is indicated when the membranes rupture early with the occiput posterior. Very many patients, especially primipara, commence labour with rupture of the membranes, and I do not think that this factor in itself has any significance at all, apart from being a possible indication of an abnormal presentation, which should always be known beforehand anyhow. Provided there is vertex presentation, it is almost a normal state of affairs and is by no means always followed by a prolonged first stage.

Post-maturity.—There is no evidence whatever that death of the fœtus *in utero* takes place from placental degeneration in cases long overdue. There are certain conditions in which we know that placental degeneration

occurs, such as severe toxæmia and syphilis, but no similar change has ever been demonstrated in so-called post-maturity.

In 1938 I read a paper before this Society which was the result of many years' practical experience, combined with an investigation into the capacity of the placenta in post-mature patients. I held then, and hold still more firmly now, to the view that it is never necessary to induce labour or otherwise interfere, merely because a patient is three or four weeks beyond the date of expected confinement by the ordinary methods of reckoning. In 1946, A. J. Wrigley read a further communication to this Society in which he amply confirmed my views, going a little further in some respects. I, myself, believe that a patient with a 28-day cycle can be twenty-eight days late in going to labour. I have never induced for post-maturity, and I have never had any cause to regret it.

The problem is confined almost entirely to the primiparous patient—that is, so far as its being a problem goes—because, in a multiparous patient, if the doctor becomes anxious or the patient's endurance gives out, and not just for post-maturity one can, with complete impunity and very often great benefit, carry out a surgical induction. If the procedure of simple rupture of the membranes is properly executed, there is no need to fear any complications produced thereby.

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Dr. G. M. Kerr: *Obstetric analgesia in domiciliary practice*

Rationale.—The advantages of relieving pain in labour are obvious in the case of the mother but recent work tends to show that the child also benefits. The precise time at which the fœtus begins to feel pain is not yet known but it has been established that immediately after delivery the baby suffers from a degree of shock arising from the trauma of birth. If the mother is anæsthetized the shock is diminished and the loss of weight normally found in the first few days is lessened.

Pharmacology.—The choice of drugs to effect such an analgesic state must be based on a most careful pharmacological review of the special circumstances involved.

Six criteria for the ideal method of relieving pain in labour were postulated by Sturrock (1939):

"(1) That it does not endanger the life of the mother or child or in any way have an adverse effect upon them. (2) That it abolishes or diminishes pain and the memory of suffering over long periods. (3) That it does not diminish uterine contractions and thereby delay labour or predispose to atonic post-partum hæmorrhage. (4) That during the second stage it does not prevent the patient from co-operating intelligently with the doctor so that an antiseptic and aseptic technique can be maintained. (5) That there is no necessity for operative delivery solely on account of the method used to alleviate pain. (6) That it is simple to give."

Up to the present it is probable that every anæsthetic, analgesic and amnesic drug in the pharmacopœia has been used to mitigate or eliminate the pains of labour but only the briefest mention can be made of those in the most common use in relation to their most salient effects.

Fœtus.—Until labour is established the fœtus is a parasite and can be ignored from the anæsthetic point of view so that if a mother recovers *completely* from a general anæsthetic before delivery the fœtus is unaffected. During labour and delivery, however, the fœtus is about to fend for itself and its respiratory centre must not be depressed by anoxia, anæsthesia or analgesia. Drugs which *depress* the respiratory centre are the morphine group, the barbiturates and pethidine—in that order of severity; it is *unaffected* by nitrous oxide when combined with at least 15% of oxygen (as such or in air), the bromides, chloral hydrate and paraldehyde; it is *stimulated* by carbon dioxide (in the presence of a clear airway), stimulation of the skin and lobeline 1/20 grain (3 mg.), or by nikethamide (Coramine) 0·5 ml., injected into the umbilical vein.

Uterus.—Until labour is established uterine tone is *diminished* by the morphine group, the barbiturates and pethidine—also, by most anæsthetics; it is *unaffected* by nitrous oxide and is *increased* by thiopentone (Pentothal). This is of particular importance because a uterus in spasm compresses the placenta and uterine blood vessels thus depriving the fœtus of its blood supply—the anoxia so caused may have grave results just prior to delivery.

During labour and delivery all anæsthetics except nitrous oxide diminish the force of uterine contractions and may even "abort" labour if given before the pains are sufficiently well established; they thus tend to prolong labour, increase the incidence of instrumental intervention and predispose to post-partum hæmorrhage. This applies also to morphine, the barbiturates and pethidine; paraldehyde has little effect.

Nitrous oxide is the drug which most nearly fulfils the required desiderata whilst pethidine fills the second place.

The analgesic potency of pethidine lies somewhere between that of morphine and codeine and 100 mg. of pethidine is said to be equivalent to 1/4–1/6 grain of morphine. In addition to its less depressant actions, pethidine has other advantages over morphine in obstetric practice; its spasmolytic effects favourably influence dilatation of the cervix, it has anti-histamine properties and has a quinidine-like influence on the heart.

Whereas morphine and pethidine are the only true analgesic drugs outside the anæsthetic group at our disposal, scopolamine is the only effective amnesic, the remaining legion being all hypnotics or sedatives.

Choice of routine.—The routine to be described has been found satisfactory.

At the *onset* of labour sedation is secured by the administration of potassium bromide and chloral hydrate in doses of 30 grains (2 grammes) each, but this is reserved for the more nervous subjects.

After labour has become *well established* and the pains sufficiently severe an initial dose of pethidine 100 mg. is given intramuscularly but gas-air analgesia is the agent of choice with "boost" doses of pethidine 100 mg. only if required—these are given at four-hourly intervals up to a maximum of 400 mg. and the final dose at least three hours before the estimated time of delivery.

The apparatus, devised by Dr. R. J. Minnitt eighteen years ago, is now in universal use and has stood the test of time; Elam has designed a modification which delivers pure nitrous oxide with the first inspiration only and is slightly more effective.

In a *prolonged* first stage, especially when due to a rigid cervix, Nembutal 3 grains (0·2 gramme) is often most effective.

During the *second stage* continuation of the gas-air is often sufficient but, when inadequate, trilene is substituted using a Marrett's apparatus and this will usually suffice for the delivery also but can be reinforced with nitrous oxide by fitting a Rowbotham's bottle to the original Minnitt apparatus.

Special procedures.—For a *low forceps* delivery trilene inhalations with a pudendal block is satisfactory. This block relaxes the outlet and anæsthetizes the skin of the perineum anterior to the anus; it is very quick and easy to perform. With the patient in the lithotomy or in the left lateral position the tuber ischii is located and an intradermal wheal raised in the skin directly over it; a needle is then inserted to make contact with the bone and 5 ml. of 2% procaine are deposited; the needle is then withdrawn slightly and is redirected medially so as to pass about 2 cm. deep to the tuber along its inner aspect where 10 ml. of the solution are injected after negative aspiration; the procedure is then repeated on the opposite side and five to ten minutes allowed to elapse for analgesia to take effect.

For *intra-uterine manipulations* good relaxation and rapid recovery of muscle tone are essential. In domiciliary practice chloroform remains essentially the agent of choice. In view of the prevalent disregard for the potent properties and toxicity of this drug, it is most regrettable that more efforts are not concentrated on instruction in its use in medical schools. The risks of delayed chloroform poisoning and myocardial degeneration are very real.

A contraction ring often resists the deepest anæsthesia; a dramatic remedy is to break a capsule of amyl nitrite under the mask.

Perineal repairs seldom require more than a continuation of inhalation analgesia, but a pudendal block will sometimes be found an invaluable adjunct.

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Section of Surgery

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A Surgeon and Medical Education

PRESIDENT'S ADDRESS

By DAVID H. PATEY, M.S., F.R.C.S.

MEDICAL education is, as the recent wave of reports and addresses illustrates, a very topical subject. My own contribution does not pretend to be authoritative; it contains merely the reflections of an individual surgeon who has happened to find himself mixed up with medical education, and in the process has tried to think out some of the principles involved. To the question why medical education should be exciting special interest at the present time, many answers might be given. But I would suggest that one touches the core of the question. The overriding fact of our time is that civilization has been challenged and has accepted the challenge. The present widespread interest in education, including medical education, is, I believe, in part the concern of civilization with the strengthening of one of its bases.

THE FIRST M.B.

When anyone writes or talks on education he is nearly always influenced, perhaps unduly, by his own subjective reactions to his own educational experiences. Such subjective reactions have, perhaps, some value if regarded as a case history to be added to other case histories which can then be objectively studied. Individually they are unimportant. I shall therefore mention only two points from my own student experiences. The first is that in those days the content and standard of the first M.B. was such that a student of average intelligence who worked well could reasonably anticipate that at the end of a year's course he would pass; and this irrespective of whether or not he had done any natural science before coming to the medical school. I still think that this normal expectation of thirty-five years ago should be the basis for the content and standard of the first M.B. to-day. The second concerns the quality of the individual teacher. Men of my generation at Middlesex were fortunate in having both in their preclinical and in their clinical years a generation of great and inspiring teachers: and since this is the Surgical Section I cannot help mentioning that great triumvirate of surgeons—Sampson Handley, Gordon-Taylor, and Webb-Johnson. Great teachers are cast in no standard mould—they are supremely individualistic. But the first quality I would give common to all would be a varying something which is capable of arousing the often inert but ignitable enthusiasms of the student. The second common quality would be a sense of humour which implies the capacity to look both at one's pupils and one's subject, and most important of all oneself, in proper perspective. And finally I would say that the highest type of teacher is actively working at or has worked at some point of the growing edge of his subject. He need not necessarily have made any new discoveries himself, but the fact of his being or having been in the front line gives him an attitude of mind towards his teaching that nothing else can.

I come now to an attempt at a more objective survey of undergraduate medical education. The first and crucial question is whether the traditional British system of medical undergraduate education is fundamentally sound. The essentials of the British system of medical education are four:

(1) Firstly, the system of graded progression of subjects leading up to the clinical years. This is of course not peculiar to the British system, and in fact the French system whereby the medical student is brought into the wards from the beginning of his medical career is the only important exception to the rule. In talking with French colleagues on this question, while they do rightly emphasize that as a result French students get the atmosphere of medicine from the beginning of their career, I have not formed the impression that they are completely convinced that the balance of advantage is with their system. And most other people consider that the little gained does not justify the cluttering up of the wards with irresponsible junior students that it entails.

(2) Secondly, the considerable degree of freedom preserved by the individual medical schools and by the individual medical firms within the medical schools to adapt the details of their educational technique to their own particular circumstances. On the Continent, the tendency is towards a much more close central control both at the University and at the State level. In America, on the other hand, the problem that they had in the past arose from the existence of large numbers of medical schools often of inferior quality without proper control; and this led to the great emphasis placed by the American educationalists on the university connexion. Much of the criticism that was directed on this score at the British system has been remedied in recent years by the strengthening of the connexions between the universities and the medical schools. In general, the British system has up till now preserved a happy balance between freedom and authority, with the emphasis on freedom. One great advantage that we in Britain have, and that we have handed on both to the Commonwealth and to America, is the existence of professional colleges with long and great traditions, which are and have been in a position to resist the imposition of too rigid controls either by the Universities or the State.

(3) Thirdly, the tradition of treating the patient as an individual with due regard for his dignity as a human being has always been a strong feature of the British system. Owing to the very heavy overhead costs, hospitals have to deal with large numbers of patients. Even with the best of intentions, it is very easy under these conditions for the individual patient with his fears and susceptibilities to be lost in the mass. The charitable

origin of many of the hospitals throughout the world increased the danger of impersonalizing the patient. While there is no occasion for complacency—and the clinical examinations of some of our great examining institutions often leave me uncomfortable—there is widespread agreement that the British system has dealt best with these dangers.

(4) The fourth point is the pivot on which the whole British system of clinical education turns—the association of the undergraduate with the work of the various clinical units in an active responsible capacity. The pivot of the German system is the lecture-demonstration, often, it has been stated, a remarkable *tour de force* by the professor. While the French with their externs and interns do have a comparable system to ours, it is only for the favoured few, determined after stern competitive examinations. The Americans too do not appear to have developed undergraduate responsibility to the same extent as we have, relying more on the post-qualification intern year. If the oft-repeated statement is true that education is not indoctrination but the opportunity to learn, then a system of controlled responsibility *should* be best.

But there has been a considerable amount of self-criticism in recent British reports on medical education, the strongest being that of the Royal College of Physicians. "They were convinced that the shortcomings of the average medical graduate are mainly to be attributed to the manner of his training." "He tends to lack curiosity and initiative; his powers of observation are relatively undeveloped; his ability to shape and interpret facts is poor; he lacks precision in the use of words." I hesitate to disagree with such an authoritative committee but since the only evidence I can find in their report to support such drastic conclusions is the personal experience of individual members of the committees with their own students and house officers, I feel emboldened to state categorically that my own experience has been quite the opposite. In fact my chief difficulty every six months when I choose a new house surgeon arises from being able to choose only one; there are usually at least half a dozen excellent candidates any one of whom I would deem it a privilege to have. My own analysis of the situation, based both on personal experience and on a study of the authoritative committee reports and other literature, leads me to the conclusion that in the traditional British system of medical education we have something which is in essence excellent and which should be jealously preserved; and particularly so since its history both old and recent shows that it contains in itself the capacity for organic growth and adjustment to changing circumstances.

Coming to a more detailed analysis, as a clinical teacher I am only in a position to give a first-hand opinion on clinical teaching. My observations on pre-clinical and pre-medical teaching will therefore be brief. There is general agreement that pre-medical training—in other words training at school—should not differ from that of any other learned profession. In practice, however, owing to the special position which the first M.B. has come to occupy in school training, the potential medical student usually begins to be shepherded along a well-defined educational path from puberty. A predominantly scientific training at school can of course be as generally educative as any other type of training. But if the stream of medicine is to continue to be enriched with students who have made classics, philosophy, history, or mathematics their principal 6th form subjects, as well as with the occasional graduate in these subjects, the first M.B. must again become what it used to be—an examination that is ordinarily passed after one year's university work, irrespective of whether the student has had previous training in science or not.

James Conant, the President of Harvard, speaking, as a scientist, of the frequency with which our actions unconsciously reflect the philosophy and poetry which we have often unconsciously imbibed over many years goes on to say: "A dictator wishing to mould the thought and actions of a literate people might be able to afford to leave the scientists and scholars alone, but he must win over to his side or destroy the philosophers, the writers, and the artists." Men whose school interest is in chemistry and in physics will always be attracted to medicine because these subjects have obviously so much to give to medicine. It is the philosophical leaven of medicine which is not so obvious, and it is this which gives to the question of the first M.B. its great importance.

The Second M.B.

There are distinguished educationalists who do not support the belief that every student should continue to take part in the dissection of the whole body, and argue that such a procedure is unnecessarily time-consuming. But the principal advantage, as I see it, is that as a result a doctor is always able to see right through a patient in a way that, for example, nurses or physiotherapists who do not learn their anatomy by dissection never do. At the same time, as clinicians we cannot but welcome the renaissance of anatomy in recent decades by the adoption of a functional and experimental approach. The musculature of the body, for example, looked at in the light of electromyography, becomes much more than the inert material of the dead-house.

The Clinical Years

If we agree that the association in a responsible capacity of the student with the care of the patient is the keystone of the British system of clinical education, then we must beware of some current trends which are tending to weaken this association: Certain clinical firms make no use officially of students' history taking. As a result the student comes to place a low value on his medical histories and so does everyone else. Yet with keenness on the part of the chief, with careful control and editing by the registrars and housemen, and by a judicious use of dictated notes, the student's notes can be made into accurate scientific records for preservation as well as serving as an invaluable educational instrument.

Then again, we have had the suggestion put forward recently in an editorial that clinical students should have regular academic terms with regular vacation periods (*Lancet*, 1951). This undermines both in theory and practice the idea that the student is a responsible cog in the medical machine. It runs counter to the report of the Goodenough Committee (1944) which was concerned, on the contrary, with applying the English system of continuous clinical instruction to Scotland. The clinical student like the doctor needs regular holidays, but the patient is always there and the student when he goes on holiday should have another student of the firm as his substitute. Ogilvie's (1950) chief criticism of American medical training was this absence of a proper responsible attitude in the matter of holidays by the medical student, and I would agree with him that it is one of the chief sources of strength of the English system.

The presence of students in the operating theatre has been much criticized in recent reports. The criticism has probably been overdone as one notices that the keen students even though they do not have to be present

are constantly popping up to the operating theatre to complete their picture of the diagnosis and the pathology by the operative findings. But the student whose case it is that is being operated on should *have* to be present as a responsible member of the operating team. The surgical dressership is also the best time for a student to do his anæsthetic training, a very valuable practical exercise as well as an exercise in applied pharmacology.

During recent interviews with candidates for house appointments I was struck by the number of men who professed a special interest in obstetrics; and on questioning I found that it was because they had had an opportunity to do something practical themselves. I think that students assisting in the operating theatre should be brought into the operation as much as possible and that to get the feel of handling living flesh, they should frequently be given, under supervision, small technical processes to do, such as skin stitching. And similarly throughout training stress should be laid on controlled practical experience. A student who has keenly and actively taken a responsible part in the work of a firm for three months comes out with an increased stature which represents much more than the total of new medical facts he has accumulated. As his pupils used to say of Steve Fairbairn (1951) the great rowing coach—"I thought he was only teaching me rowing but he taught me much else besides."

A word may perhaps be interposed here on the subject of the teaching of general principles, because it is a subject on which there is much confused thinking. It is often stated that the student is too much stuffed with factual details, and that his education should deal more with general principles. As a corollary, the idea has grown up that there are certain departments of medicine and surgery which teach general principles and not factual details (often identified as departments of general medicine and surgery); and departments which teach specialized methods of observation and techniques (often identified as special departments). I should like to examine critically both these ideas. General principles are not things which necessarily lie on the surface, to be easily recognized and picked up. And teaching based on the principle that they are will of necessity be superficial. Such teaching will of course be rejected by the intelligent student. A typical example of this is the nausea aroused in the boys of Kipling's story by the lecturer who unfurled the Union Jack. Fundamental principles are often delicate things to handle in the raw. And to get at them one may have to drive through a mass of factual detail. The point was well put in a recent review discussing the universalism of French literature. "It has been remarked", the writer said, "that the French writer is never so genuinely universal as when he is firmly rooted in the particular, never so truly spiritual as when he is anchored in the concrete" (*Times Literary Supplement*, 1951).

The second idea that there are two types of clinical department—general and special with two totally different qualities and functions—is, I submit, no longer tenable. All knowledge is now necessarily in compartments, though the walls of the compartments should be elastic and movable and have wide intercommunicating doors. General surgery is a special department in the edifice of surgery. From the teaching point of view it has two positive advantages—that of not having a limiting label with, as a result, a possible wider range and a greater flexibility of material; and secondly, a keener sense of the tradition of using detailed facts to convey general principles.

If what I have said is accepted, certain consequences follow. The first is that there is no reason why many of the special departments should not become general medical and surgical firms, i.e. firms which receive students as an integral part of their organization and demonstrate the general principles of medicine and surgery. One great advantage of this would be that the number of firms receiving dressers would be increased, with the reduction of the present often excessive numbers on a firm and the possibility of greater individual attention. The second consequence would be the necessity for an even greater care and supervision in the selection and presentation of lectures and lecture-demonstrations. Education, like a modern military operation, is best conducted not by an attempt at a uniform advance on a broad front, but by a series of deep advances on limited fronts. Ultimately the points of advance need to be joined up, and in medical education this is the ideal use of the lecture and lecture-demonstration. The supervision of all this should obviously be the responsibility of the professors of medicine and surgery. These should be, not as they so often are now, merely heads of a clinical unit, distinguishable from heads of other clinical units only by being full time. The professor of surgery should be director of surgical studies with the responsibility for integrating the compartmental teaching—much more important than his personal professing. To direct surgical studies adequately he needs the express right of access for the purpose of teaching to all the surgical material of his hospital. And apart from cordial official and unofficial relations with his colleagues, important agents in this access could be the surgical registrars. These would be, in part, assistants to their individual chiefs, as at present, and in part junior teachers, responsible to the professor. It is interesting that the teaching hospital of London which comes nearest to achieving this ideal is one that has not in fact a professor of surgery but a director of surgical studies. This suggests that an addition to or change of title of the professor might have advantages. But I am not sure that we ought not to go further, and that the teaching hospitals and medical schools ought not to advise the universities that the old idea of a professor of surgery is out of date, and should be replaced by the more modern idea, and one much more suited to the English system, of a director of surgical studies.

Men from the older universities, when they apply their thoughts to clinical education, often exhibit a nostalgic longing for the tutorial system. But this important by-product of the combined college-university educational system is difficult to apply to clinical work and I know of no serious attempt to work it out into an efficient detailed scheme. I would suggest that the counterpart of the tutorial system in clinical medicine is the small firm in which the chief and his assistants have the opportunity to know and control the work of each of the dressers personally. The director of surgical studies in addition to being head of a small firm himself represents the co-ordinating and integrating function of the university.

I do not propose to refer in detail to those two most important instruments of education—the textbook and examinations. I will only say this—that their importance is such that they ought to be under constant review by responsible educational authorities. And the final point I would like to make on undergraduate medical education is to refer to two recent experiments of my own in ward teaching. The first is that instead of seeing new patients in the wards they are seen in a surgeon's room adjoining the wards, where the surgeon and firm receive them in an atmosphere as close as possible to that of a consulting room. The dresser reads the history, and the case is examined in the usual way. The system is popular with the patients as it avoids the public ward discussion of what should be to the greatest possible extent a private affair; it is nicer for the

surgeon who can be free in his discussion after the patient has returned to the ward; and to the students it avoids the main burden of a teaching round—an excessive preoccupation with the weariness of the legs. The old patients are visited and the follow-up controlled in the usual way by an ordinary ward round. If this experiment proves a long-term success, it will have architectural implications, in that modifications will have to be made in the design of ward units in the teaching hospitals, so as to provide a properly designed and equipped surgeon's consulting room. The second experiment which I have only just adopted is to give each firm of students an assignment for study during their dressership. The first assignment I gave was—"the reaction of the patient to the special features of a teaching hospital." At the end of the dressership each student presents a documented report on his study, and he who is adjudged to have presented the best report is awarded a small prize. I am not yet prepared to say whether this will be merely a temporary stunt or will prove to be a valuable educational experiment. But so far the students seem enthusiastic and the quality of the reports high.

Post-Graduate Education

Controlled responsibility occupies the same key position in the early years that it does in undergraduate education though of course with increasing responsibility. The most striking official recognition of this is the new but not yet implemented compulsory intern year, an old-standing feature of American education. Those responsible for grading posts as suitable for the intern year will have to be careful that they do not fall into the same limiting fallacies about general and special clinical departments that I have already mentioned in undergraduate training. To be a house surgeon even in a highly technical specialty to the right sort of chief is much more educative than to be a house surgeon to the wrong sort of chief in a so-called general department; and the better education will stand the individual in better stead even in a totally different field of special activity such as general practice.

After the early apprenticeship years the two keys to post-graduate education are research and communication. New knowledge is acquired in clinical medicine in two chief ways comparable to the field studies, and laboratory studies of many other sciences. Both types of study make use of both the observational and the experimental method. In the past this country has probably led in the field-study type of research by practitioners in all branches of medicine who in the course of their routine practice have made new observations or worked out improved methods of treatment. But we are probably behind America in defining and segregating fundamental clinical problems for special investigation. There are, however, two factors very favourable to an intensified wave of clinical research in Great Britain: the first is a pool of young keen intellects in the consultant and registrar grades, who do not have to wear themselves out trying to scrape together a living: and the other is the forward policy adopted by many Boards of Governors of hospitals in using extensively their endowment funds for research purposes; and I would like to mention particularly the recent action of the Board of Governors of the Middlesex Hospital in buying and equipping a large building as an Institute of Clinical Research. The conservation of endowment funds and the attraction of further funds for prototype experiments in medical research and education should be one of our principal objectives.

The technique of scientific communication like that of all forms of communication is still making staggering advances. We are all familiar with the coloured film with its lifelike reproduction of operations. Hedley Atkins has introduced television of operations to us here in London, and at the recent meeting of the International Congress of Surgeons in Paris we had the opportunity of seeing coloured television of operations. At the same meeting we also had the opportunity of discovering how the language difficulty of international meetings is now solved by the system of multiple instantaneous translations to earphones. The University of Paris has its own broadcasting station—Radio-Sorbonne—which diffuses direct from the main lecture theatre of the Sorbonne. But with all this the two chief agencies of scientific communication are still scientific literature and the learned society. And in this connexion I would refer to the special integrating function of this Section of Surgery of the Royal Society of Medicine.

In conclusion, I should like to quote from Wangensteen's introduction to the printed proceedings of the Surgical Forum on Fundamental Surgical Problems of the American College of Surgeons (1951). "Men are imitative. That which contributes to the growth and development of the best men in any profession also is best therefore for the group as a whole. Some do not believe this. I believe it to be one of the great lessons of life. Much effort of a society frequently is directed at improving minimal standards. An equal effort directed at the highest level will I feel pay greater dividends—gains and advantages which will accrue to all engaged in the common venture." This reassertion and reapplication of the doctrine of aristocracy by a surgeon of the great American democracy is for us interesting and perhaps timely. The wheel has turned full circle. And my Address, too, has been brought back to its starting point. And it is of my old teachers that I am particularly thinking when I conclude by echoing the conclusion of a great English educationist—Sir Richard Livingstone—that the finest education in any subject is the contemplation of excellence.

"We needs must love the highest
when we see it."

Tennyson.

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Proceedings of the Royal Society of Medicine Vol. 45 29

Clinical Section

President—HAROLD EDWARDS, C.B.E., M.S.

[*October* 12, 1951]

MEETING AT ST. THOMAS'S HOSPITAL, LONDON, S.E.1

Two Cases of Cataract Extraction with Plastic Lens Implant.—W. E. S. BAIN, F.R.C.S. (for HAROLD RIDLEY, F.R.C.S.).

I.—Mr. E. B., aged 40.

First seen in February 1951 with a mature cataract in the right eye. Vision of the left eye was 6/5, unaided.

No cause was found for the cataract, and the left fundus was normal.

In May 1951 the right cataract was extracted by the extracapsular method, and replaced by a plastic lens. Convalescence was uneventful, and by July 1951 his right vision was 6/9 unaided, and 6/5 with a — 0·5 d. sphere. He retains this visual acuity at the present time.

II.—Mrs. K., aged 63.

First seen in July 1951 with a history of progressive deterioration of the right vision. She was found to have a mature cataract in the right eye, and the vision of the left was 6/9 unaided.

In the same month a right extracapsular cataract extraction was done, and a plastic lens inserted.

The eye settled down uneventfully, and by the end of September her right vision was 6/36 unaided, and 6/9 with a — 2·5 d. sphere.

Lipoma of Chest Wall, Mimicking Unilateral Enlargement of the Male Breast.—M. R. WILLIAMS, F.R.C.S. (for P ofessor G. PERKINS, M.C., M.Ch.).

F. H., a man aged 63, complained of a lump which he had noticed in the left breast for three years. At no time had it caused him any pain. At first the breast was about the size of an orange, but it had gradually got larger so that now he could no longer conceal it under his clothing, and this caused him considerable embarrassment. There had been no discharge from the nipple. He had always enjoyed good health.

On examination he was a fit man, well preserved for his age. The right breast was normal, but the left breast was the size of a bulky female mamma (*see* Fig. 1). On closer examination it was found that the mass was deep to pectoralis major, and was quite separate from the nipple. The lump was soft and pseudo-fluctuant. X-rays showed that the lung fields were clear and that there was no change in the bony thoracic cage. There were no other abnormal physical signs.

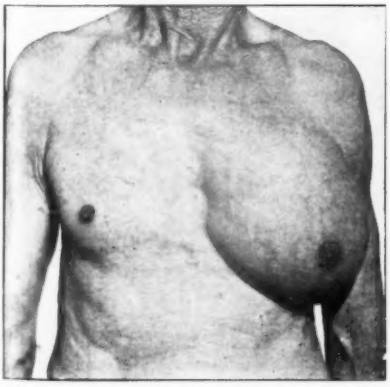

FIG. 1.—Pre-operative appearance showing large mass in left breast region.

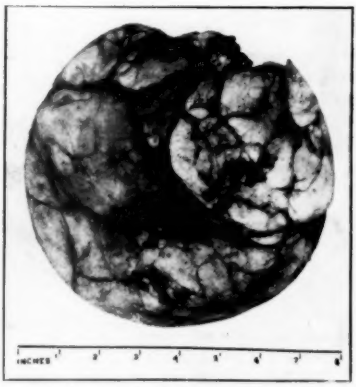

FIG. 2.—Encapsulated multilobular lipoma.

A diagnosis of a lipoma of the chest wall was made.

At operation the mass was found to be an encapsulated multilobular lipoma (Fig. 2) lying deep to pectoralis major and minor and superficial to the chest wall. It was enucleated without difficulty. Section of the tumour showed it to be a typical lipoma (Fig. 3).

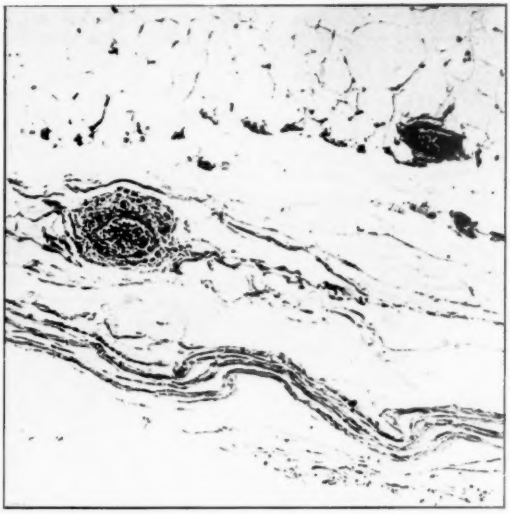

FIG. 3.—Section of tumour, × 75. Hæmatoxylin and eosin show appearance of lipoma.

The interest of this case lies in the bizarre appearance produced by a lipoma of chest wall, so placed as to resemble at first glance a gross unilateral enlargement of the male breast.

Mr. R. Kenneth Bowes: I agree with Mr. Williams' diagnosis of a subpectoral lipoma. The physical signs seem very characteristic of this condition. I remember a very similar case in a female patient in whom there had appeared to be unilateral hypertrophy of the breast but the main mass of tissue could be demonstrated to be under the pectoralis major and was quite separate from the gland. At operation it was found to be a lipoma.

Mr. Selwyn F. Taylor: I would suggest that this tumour of the breast may be a hamartoma. I have operated upon a somewhat similar one which proved to be exceedingly vascular and the pathologists provided this diagnosis. Perhaps it might be well also to mention the mesenchymoma, a connective tissue neoplasm of immature vascular, fibrous and adipose tissue.

Myelofibrosis.—R. B. FRANKS, M.B., M.R.C.P. (for J. S. RICHARDSON, M.V.O., M.D., F.R.C.P.).

Mrs. C. H., aged 45.

First seen at St. Thomas's Hospital in 1948, complaining of asthenia for nine years and swelling of the abdomen for five.

In 1945 a diagnosis of chronic myeloid leukæmia had been made elsewhere on the finding of gross splenomegaly and on the appearance of the peripheral blood (*see* Table I), and some

TABLE I.—PERIPHERAL BLOOD: WHITE CELL COUNTS

Date	19.7.45	17.9.48	30.5.49	20.5.50	19.3.51	6.10.51	
Total	30,300	30,000	24,100	22,300	18,600	14,700	
Polymorphs	38	81	82	88	89	86	%
Lymphocytes	16	3	2	1	1	10	%
Monocytes		3	1·5	2		2	%
Eosinophils			4·5	5	1	2	%
Basophils		2	1		2		%
Band forms	30	7	1	3			%
Metamyelocytes	4	3	2		4		%
Neut. myelocytes	10	1	3	1	3		%
Eosin. myelocytes	2						%
Myeloblasts			0·5				%
Normoblasts			2·5				%

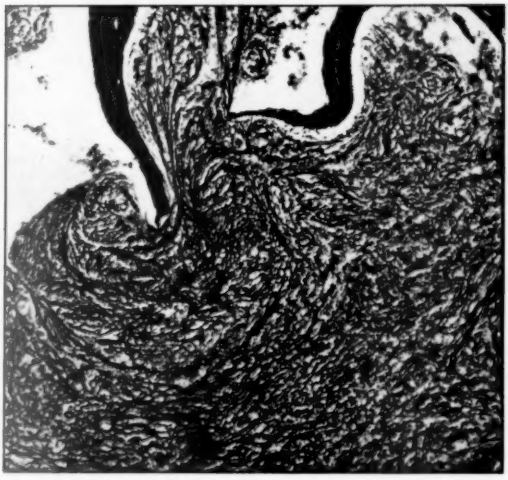

FIG. 1.—Sternal marrow trephine biopsy. (Reticulin stain × 100.) Shows diffuse increase in reticulin fibrils replacing normal hæmatopoietic tissue.

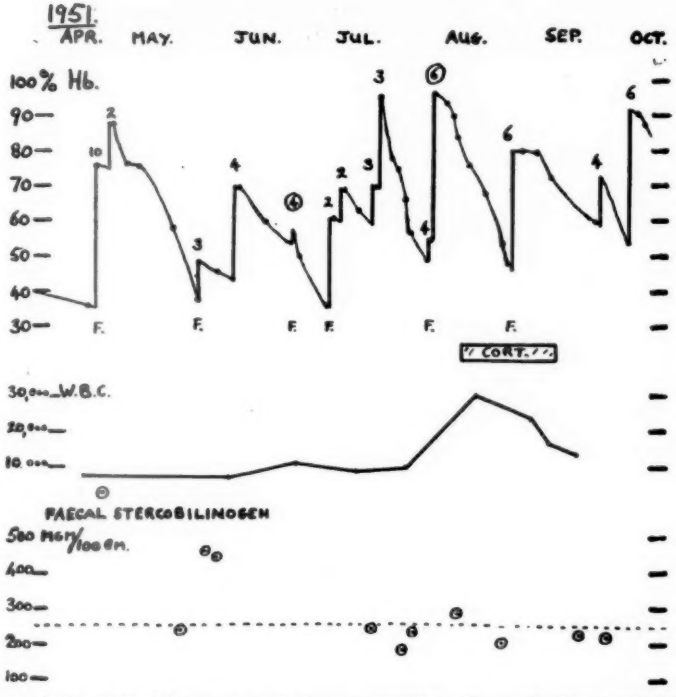

FIG. 2.—Hæmoglobin, total white count and pigment excretion. Numerals above vertical lines refer to pints of donor blood, those in circles being of Group O.

CORT = Cortisone therapy. F = Cardiac failure.

(Dr. Franks' case of Myelofibrosis.)

radiotherapy was given in that year. In 1948, in view of the small numbers of primitive cells in the peripheral blood, no treatment was given. In the following year the diagnosis was revised to that of leuko-erythroblastic anæmia because of the presence in the peripheral blood of primitive white and red cells, together with the finding of a normal sternal marrow smear. In May 1950 the final diagnosis of myelofibrosis was established by sternal marrow trephine biopsy (*see* Fig. 1).

Up to March 1951 only two transfusions had been necessary to keep the hæmoglobin at about 80%, but from this time the rate of fall began to increase, excessive hæmolysis was apparent in increased pigment excretion and frequently repeated transfusions became necessary (*see* Fig. 2).

In July the rate of destruction of Group O donor cells was found by differential agglutination to be greatly increased. In August, during a month's trial of cortisone therapy, the rate of destruction was found not to differ significantly. (These studies were kindly carried out by Dr. H. Chaplin of the Blood Transfusion Research Unit, Post-graduate Medical School of London.)

Since this time the fall of hæmoglobin continues unchanged. Transfusion is necessary at frequent intervals since cardiac failure supervenes at about 50% hæmoglobin, even with bed-rest. Reticulocytes are constantly less than 2%. The white count is now only slightly raised and there are no primitive cells in the peripheral blood. The platelet count is normal and there is no bleeding tendency. The spleen reaches to the pubic symphysis, the liver edge is palpable 3 inches (7·5 cm.) below the right costal margin but there is no palpable lymph-gland enlargement. Bone X-rays show no abnormality.

Comment.—The technical difficulty of removing such a vast spleen is likely to be considerable and some extra-medullary hæmatopoiesis may be occurring in the spleen. It is felt, however, that the spleen may be playing a prominent part in the rapid red cell destruction and that it may also be suppressing any remaining marrow function (Edwards, H. C., 1951, *Lancet*, ii, 601).

Frequent transfusions are becoming more and more difficult because of shortage of veins and, in addition, the risk of reactions connected with rare blood groups becomes greater as time goes on. Splenectomy seems to offer the only hope of reducing the rate of cell destruction. Even if the operation produced at the same time a virtual secondary aplastic anæmia the removal of the hæmolytic element should put the patient in a better position regarding transfusion requirements than at present.

The President: One of the many interesting features of this case is the failure of cortisone to lengthen the life of the red corpuscle. There has recently been a suggestion that cortisone produces a beneficial effect in acquired hæmolytic anæmia, and that it may in familial hæmolytic anæmia be used as a pre-splenectomy measure because of this beneficial action. I should certainly be in favour of splenectomy for this patient. It is clear that she is now going downhill rapidly, and that blood transfusions are becoming progressively less effective. She would indeed benefit considerably from removal of this large splenic tumour even if it had no direct effect upon the rate of hæmolysis. However, it is highly probable that its removal will also have the effect of prolonging the life of the erythrocytes; and although for this condition splenectomy is not curative, it is likely to prolong the patient's life considerably. The risk of operation is clearly less than was the case before antibiotics and blood transfusions were so readily available. It cannot be denied, however, that the operation is not entirely free from risk. In my opinion, that risk is justifiable in this patient.

Further report.—17.10.51: Splenectomy was carried out by Mr. R. H. Boggon. The spleen measured 26 × 14 × 8 cm. Smears and sections showed neutrophil and eosinophil granulopoiesis but no erythropoiesis.

Two days after operation a 10% reticulocytosis occurred and the hæmoglobin climbed from 82% to 100% in ten days. White cells rose from 14,600 (polymorphs 93%) to 54,900 (polymorphs 100%) in two days. Platelets rose from 110,000 to 838,000 in a week.

15.11.51: The patient feels very well. Blood values are: Hb 105%; white cells 37,000 (P. 93%, L. 5%, E. 2%); platelets 980,000.

A further study of donor-cell survival is being made and a report will be made to the Section in due course.—R. B. F.

Section of Urology

President—ARTHUR JACOBS, F.R.F.P.S.Glas.

[*October* 31, 1951]

Uretero-intestinal Anastomosis: Observations on Technique and End-results with a Review of 138 Personal Cases [*Abridged*]

PRESIDENT'S ADDRESS

By ARTHUR JACOBS, F.R.F.P.S.Glas.

SHORTLY after the late Professor Grey Turner's (*Brit. J. Surg.* (1929) **17**, 111) description of 17 cases on whom he had performed transplantation of the ureters for congenital defects of the bladder and urethra, there came under my care a boy of 6 who was totally incontinent as a result of a congenital deficiency of the urethra associated with a reduplication of the penis. One ureter was successfully transplanted. At the second-stage operation to implant the other ureter a month later, the boy died under the anæsthetic.

Nearly three years elapsed before my next uretero-intestinal anastomosis, performed on a woman, 42 years of age, who suffered from incontinence due to a urethro-vesico-vaginal fistula which had been acquired two years earlier as a result of an attempt to cure her of stress incontinence. Three unsuccessful efforts to close the fistula had already been made. A two-stage implantation by the Stiles technique was carried out. That patient was followed up for seventeen years (Fig. 1). She died in 1949, five days after a cholecystogastrostomy had been performed elsewhere for relief of an obstruction in the common bile duct due to a tumour originating in the head of the pancreas. Until the onset of that fatal illness she had led a happy life. The post-mortem examination, it was reported, showed that both kidneys had numerous scarred areas on the surface and on section, the appearances being those of old-standing pyelonephritis. The cortex was of normal width and the cortico-medullary marking well preserved. There was no recent inflammation in the renal pelvis and the ureters had an unobstructed entry into the bowel.

In the succeeding years there were 1 or 2 operations yearly until 1940 when 7 were recorded. The numbers dealt with each year thereafter are shown in Table I.

TABLE I.—URETERO-INTESTINAL ANASTOMOSIS

Year	*Number of operations*
Up to 1939	10
1940	7
1941	4
1942	7
1943	9
1944	4
1945	9
1946	15
1947	8
1948	15
1949	14
1950	26
1951 (up to June)	10
	138

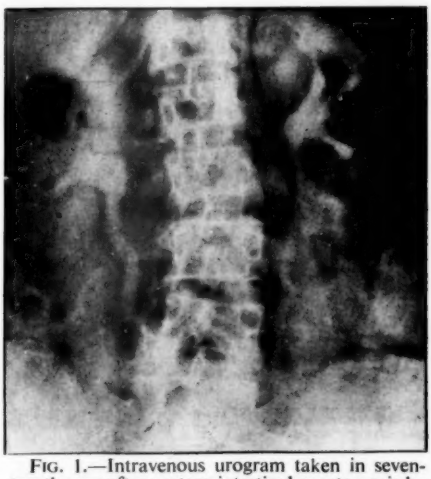

FIG. 1.—Intravenous urogram taken in seventeenth year after uretero-intestinal anastomosis by Stiles' technique. The implantation was performed for vesico-vaginal fistula.

Operative technique.—During the earlier phase of this work, I bore in mind the admonition of Grey Turner to acquire experience in one method of proved efficiency and then adhere to it. This wise advice was given at a time when congenital anomalies were considered to be the main indication for the operation. In the first cases Stiles' technique (Fig. 2) only was used and one ureter at a time implanted. In 1938 the Coffey No. 1 technique (Fig. 3) was employed, also at first as a two-stage procedure. By 1940 a simultaneous implantation of both ureters had become routine except under special circumstances. The simple method of Stiles was not discarded, however. In 1948 the direct end-to-side elliptical anastomosis of Nesbit was tried out for the first time (Fig. 4). This was in a case of bladder carcinoma with ureteral dilatation resulting from back pressure of the tumour which overlay the left ureteric orifice. The undilated right ureter was implanted by the Coffey No. 1 method and the dilated left ureter by the Nesbit method. Intravenous urography eighteen days after the transplantation showed that the dilatation in the left urinary tract had resolved whilst moderate dilatation in the previously normal right side had occurred. That result encouraged me to continue with the end-to-side technique and to date the method has been used for 32 ureters in 30 patients.

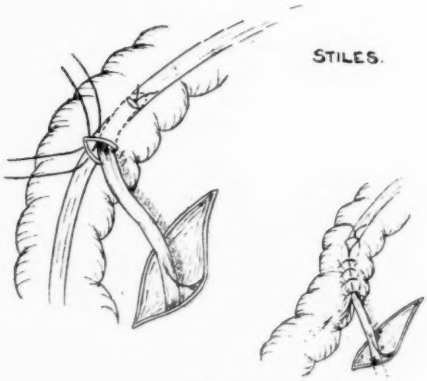

FIG. 2.

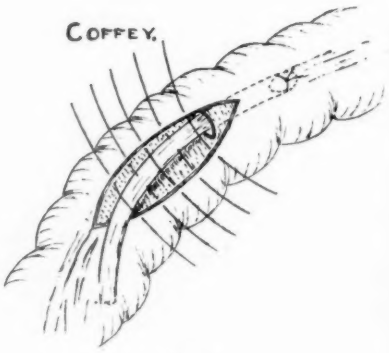

FIG. 3.

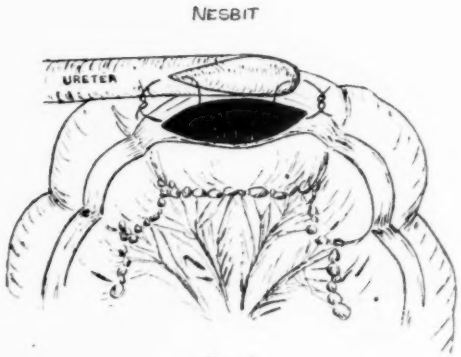

FIG. 4.

FIG. 2.—The bowel wall is approximated over the ureter after the latter has been anchored within the lumen.

FIG. 3.—The ureter lies on the external surface of the mucosa before entering the colon. The sero-muscular edges of the bowel bed are sutured together over the ureter.

FIG. 4.—The edges of the split end of the ureter are directly anastomosed to an opening in the bowel of corresponding size.

Thus aside from occasions when the call of some new suggestion temporarily lured me, these three techniques have been adhered to. I regard the Coffey No. 1 method as my basic procedure. The bowel-bed made is a short one, only one layer of sutures is used to approximate its margins and care is taken to avoid constricting the ureter, particularly where it enters the anastomosis. Stiles' method is simple to perform and quickly accomplished. Because of this and the proof obtained from some of my earliest cases that it gives good results, I have in the last three years often reverted to this method when carrying out transplantation of the ureters and total cystectomy as a one-stage procedure on selected cases of bladder carcinoma, my aim being to complete the whole operation in as short a time as possible. Nesbit's method of making a direct anastomosis between the split end of the ureter and the bowel seemed particularly applicable to the implantation of the dilated ureter and has therefore been frequently used when deviating the urine for tuberculous vesical contracture.

In assessing the relative merits of the different ways of performing uretero-intestinal anastomosis the chief consideration after mortality and immediate morbidity is that of reducing to a minimum the possibility of stricture developing at the site of anastomosis. My experiences to date with the method of direct anastomosis lead me to believe that it is less likely to be followed by constriction, with the inevitable sequelæ of hydro-ureter and hydronephrosis than is a valve-like oblique insertion of the ureter through the wall of the bowel with a ureteral stump projecting into the bowel lumen. The acknowledged causes of stricture formation after implantation are the occurrence of fibrosis in the ureteral stump, infection in the bowel bed with subsequent fibrosis there and constriction of the ureter by the stitches bringing the seromuscular layers over it. Nesbit's method which gives a wide ostium, with no projection of the ureter into the bowel and no tunnel through the bowel wall seems to minimize the possibility of these complications. The question that arises, however, is whether the elimination of a valve-like insertion increases the risk of a direct ascending infection from reflux of bowel content up the ureteral lumen. Investigations carried out in my department have confirmed that reflux up to the kidney can occur after the end-to-side technique (Figs. 5 and 6). It was demonstrated in 2 out of 10 patients who were given diodone enemata at varying intervals after transplantation. It is obvious that good as well as indifferent results may follow any of the recognized methods of uretero-intestinal anastomosis.

FIG. 5.—Post-operative intravenous urogram following uretero-intestinal anastomosis for vesical exstrophy. The right ureter was implanted by the Nesbit technique, the left by Stiles'.

FIG. 6.—X-ray following opaque enema, fifteen months post-operative. Note the pneumopyelo-ureterogram on the right side and radio-opaque fluid in the upper calyces (same case as Fig. 5).

A poor result may not be due to the method itself but to the mode of its performance or to the conditions encountered at operation and the nature of the lesion which necessitated it. The direct methods certainly offer a greater opportunity for gas or fæcal material to pass up from the bowel. This has to be weighed against the greater possibility of ureteral obstruction and consequent dilatation of the upper urinary tract associated with the oblique methods such as the Coffey No. 1. The period of observation by the direct method is too brief to allow of any long-term assessment; only a few of my cases having been operated on more than two years ago. Observations within this period as judged by clinical reaction, pyelographic studies and blood chemical estimations point to a favourable post-operative wellbeing, but no final conclusions can be drawn until the elapse of a further passage of time.

ELECTROLYTE DEPLETION

I am not attempting in this communication to discuss that aftermath of uretero-intestinal anastomosis, acidosis. The problem of determining whether the blood-electrolyte changes are due to absorption from the bowel with subsequent losses through the intestinal mucosa or to renal injury, or as seems most likely, to both causes, is exercising many minds just now. Post-operative biochemical estimations and clinical observations made on 40 patients from my series have so far given no indication that any one particular method of implantation predisposes to the condition more than another. When patients are encountered in an acute phase of acidosis, improvement will generally follow the insertion of a rectal tube for a few days and intravenous infusions, varied according to the biochemical findings. For those who develop chronic acidosis, the simple measures of giving alkalis by mouth with a low salt diet usually suffice to restore adequate equilibrium. It should no longer be considered a matter for congratulation that a patient has a four- to five-hourly diurnal frequency with no nocturnal disturbance for perhaps eight hours. The bowel should be emptied at two- to three-hourly intervals during the day and at least once at night. If these precautions are maintained such drastic countermeasures for acidosis as the establishment of permanent colostomy or of ureterostomy should seldom be required, though acute exacerbations may in some instances have to be dealt with from time to time.

Indications

The present-day indications for transplanting the ureters can be classified under four headings, namely: (*a*) bladder contracture, (*b*) malignancy, (*c*) trauma and (*d*) congenital anomalies (*see* Table II).

These are mentioned in the order of frequency as occurring in my personal series. The groups will be dealt with in turn, giving the results obtained for each. Any attempt at such a study unless related to the condition for which the uretero-intestinal anastomosis was carried out would have but little meaning.

Table II.—Uretero-intestinal Anastomosis

For bladder contracture ..	57 (46 tuberculous)
„ malignancy	51 (46 bladder)
„ trauma	26 (22 vesico-vaginal fistula)
„ congenital abnormalities	4
	138

(*a*) *Vesical contracture* (tuberculous and interstitial).—With a total of 57 patients, 46 tuberculous and 11 interstitial, this group is the largest in the series.

The usual indication for deviating the urine of these patients is an intolerable frequency due to progressive bladder contracture. In the tuberculous sufferer this is generally associated with some degree of dilatation in the ureter and renal pelvis of a solitary kidney, a nephrectomy having previously been carried out. Sometimes the dilatation in the remaining kidney and ureter though uninfected by tuberculosis is the predominating feature.

Table III.—Uretero-intestinal Anastomosis for Vesical Contracture (Tuberculous)

No. of patients	46	
Operative mortality	6	
Died within a year	9	
Longevity of remaining 31 patients		
Lived 1 to 2 years	2	8
„ 2 „ 3 „	4	
„ 3 „ 4 „	2	
Alive Under 1 year	8	23
„ 1 to 2 years	4	
„ 2 „ 3 „	3	
„ 3 „ 4 „	1	
„ 4 „ 5 „	1	
„ 5 „ 6 „	3	
„ 6 „ 7 „	2	
„ 9 „ 10 „	1	

Fig. 7.—Intravenous urogram four years after transplantation of the left ureter by the Coffey No. 1 technique for tuberculous vesical contracture. The right kidney is calcified and functionless.

Uretero-intestinal anastomosis is very much a palliative in the tuberculous sufferer for a large percentage of the patients must inevitably succumb to the systemic infection which afflicts them. Thus in my series, 27 of the 46 had clinically recognizable extra-urinary foci in the form of pulmonary, bone or joint, genital or intestinal lesions or a combination of these afflictions. Moreover in 24 the transplanted ureter was from a proven tuberculous kidney. A nephrectomy had been carried out in 35 of the 46 patients in periods varying from six months to twelve years, the average interval between nephrectomy and transplantation being four and a half years. In 4 patients with established bilateral lesions when first seen, the kidney with the more advanced lesion was removed and the ureter of the contralateral kidney transplanted within a period of three months. Six patients had a calcified and completely functionless kidney on one side so obviating the need for nephrectomy (Fig. 7). One patient had a congenital solitary tuberculous kidney.

With this background of urinary tract and other systemic pathology the results of operation and the post-operative longevity are of interest. The youngest patient was a boy of 15, the oldest a man of 55, the average age being 29. There were 21 females and 25 males. Post-operative deaths were 6 in number. All 6 had tuberculous involvement of the side transplanted and 4 of the 6 had additional clinical extra-urinary foci. A further 9 succumbed within twelve months of operation. An analysis of the longevity of the remaining 31 is given in Table III.

In evaluating the results of uretero-intestinal anastomosis as a method of relief in urinary tuberculosis it must be borne in mind that reported statistics show that about 50% of patients with clinical unilateral renal tuberculosis do not survive five years following nephrectomy and 85% of patients with clinical bilateral renal tuberculosis die within two years. As mentioned, four and a half years on an average had elapsed between nephrectomy and transplantation in my series and in at least 50% the remaining kidney had become infected. From my figures showing longevity after operation I feel justified in saying that following a successful transplantation the life expectancy of a patient with urinary tuberculosis is not diminished. It may in fact be frequently prolonged, by preventing progressive renal destruction due to back-pressure dilatation arising from a contracted bladder or strictured ureter. None will deny the easement of suffering of these generally young people, after a deviation of the urine.

Analogous to contracture of the bladder due to a secondary tuberculous cystitis is that resulting from long-standing, uncontrolled, non-tuberculous infections and from those lesions referred to as interstitial, panmural or parenchymatous cystitis and Hunner's ulcer. Uretero-intestinal anastomosis has been performed on 11 patients with this type of lesion, who, in spite of prolonged and repeated treatments by tidal irrigation, forcible over-distension, multiple fulgurations and pre-sacral sympathectomy, carried out in most instances over a period of years, have remained intractable. Table IV gives the long-term results.

TABLE IV.—URETERO-INTESTINAL ANASTOMOSIS FOR VESICAL CONTRACTURE (NON-TUBERCULOUS)

Number of patients	11		Alive	1 year 3 years	4
Operative mortality	4				
Died 5th year	2	1 from Parkinson's disease 1 following nephrolithotomy		4 „ 8 „	
7th „	1	(from rectal carcinoma)			

(*b*) *Malignancy*.—Malignancy has been the second indication in order of frequency for deviating the urine, there being 51 patients in this group. 45 suffered from carcinoma and one from lymphosarcoma of the bladder. One female patient had a urethral carcinoma causing retention and another had vulvar carcinoma spreading towards the urethra. Also included are 2 female patients with severe late bladder sequelæ after radium treatment for cancer of the cervix and a male patient who, subsequent to X-ray and radium therapy for penile carcinoma, developed a progressive tissue destruction until finally when he came under my care, the penis was destroyed and the urethral opening was located within a sloughing mass in front of the symphysis pubis.

The youngest patient was 39 years, the oldest 70 and the average age was 56 years. 8 out of the 46 with bladder malignancy were females, one of whom had the lymphosarcoma.

In assessing the results of uretero-intestinal anastomosis in bladder cancer two entirely separate factors have to be taken into account, the bladder lesion and the anastomosis. In 12 of the 46 patients transplantation only was carried out as a deliberate palliative measure. Three died within a week of operation; the others lived for periods of two to six months.

Of 34 patients on whom cystectomy was planned 2 died after the transplantation. 19 had a two-stage transplantation and cystectomy with a mortality of 5, and 13 had a one-stage operation with a mortality of 3. There were thus 24 out of 32 who survived transplantation and cystectomy (*see* Tables V and VI).

TABLE V.—URETERO-INTESTINAL ANASTOMOSIS FOR MALIGNANCY

Bladder			46
Operative mortality	5 after transplantation		13
	5 „	2-stage cystectomy	
	3 „	1 „ „	
Extravesical malignancy			5
Operative mortality			2

TABLE VI.—URETERO-INTESTINAL ANASTOMOSIS FOR MALIGNANCY

Longevity of 33 *patients with bladder malignancy surviving operation*

Palliative transplant only: lived or living for 2 to 6 months			9
Transplantation + Cystectomy	Survived less than 12 months		12
„ „	Survived 16 to 40 months		4
„ „	Alive over 12 months: 1 (1-stage)		8
„ „	Alive over 18 months: 1 (lymphosarcoma)		
„ „	Alive over 24 months: 6 (4 had 1-stage)		

Longevity of 3 *patients* with extravesical malignancy surviving operation

1 died at 12th month
1 alive at 8th „
1 „ at 4½ years

Transplantation of the ureters with cystectomy for bladder cancer is a method of treatment that is optimum for only a limited number of the total sufferers encountered and is then applicable to only a specific proportion. It is the best that can be done for a selected group of bladder tumours, the treatment of which by any method remains very imperfect. The melancholy high mortality occurring within a year of operation after this had been accomplished with apparent success is an experience shared by others. There is evidence that the manipulation associated with the cystectomy can cause an exacerbation of the malignant spread. Thus of the 12

patients who survived less than a year after an immediately successful transplantation and cystectomy, 7 at least, as was proved by autopsy or clinical and X-ray examinations shortly before death, succumbed to the malignancy. 5 had pelvic recurrences, 2 associated with infiltration of the bony pelvis and 2 with infiltration of the abdominal scar. Another had metastases to ribs and another to a lumbar vertebra. Some of these patients would undoubtedly have survived longer if a less radical procedure had been employed or indeed with no treatment. Their short survival in most instances was not due to the transplant; it was the result of the malignancy and its possible activation by the operation.

(*c*) *Trauma.*—Of the 26 patients operated on for trauma, 22 suffered from vesico-vaginal fistula. The fistula was of obstetrical origin in 15 and in 6 was a sequel to operation, a hysterectomy accounting for 5 and a colporrhaphy for 1. In the case of a young woman of 20 who had an associated recto-vaginal fistula, the lesion was alleged to have been a sequel to a criminal assault. The optimum treatment for vesico-vaginal fistula is of course a repair of the fistula and deviation of the urine is not justified if this can be accomplished. In the majority repair is possible but a few defy all efforts. It is these particularly difficult cases who ultimately gravitate to the urologist after previous repeated efforts at closure have failed. In the series were 8 patients who had endured their fistulæ for periods of between seven and twenty years. Most had had three to four attempts at repair and 1 had had ten.

The bald figures showing mortality and long-term results (*see* Table VII) tell nothing of many real tragedies behind them. Thus the patient who died eight months after operation had endured a fistula for twenty years. Eight months after the transplantation she exhibited symptoms of intestinal obstruction. The true diagnosis was at first missed and she died from exhaustion the day after operation was finally performed. A solitary thin band between the omentum and the lower end of the abdominal scar was the sole factor responsible for the obstruction which a colleague expeditiously found and divided. The patient who died seven years after the transplantation had had a post-obstetrical fistula for sixteen years. During that period she had borne 4 children in addition to the one whose birth had resulted in the fistula. She was transferred from another hospital where she had had a suprapubic lithotomy for the removal of a massive stone which had been protruding into the vagina. Dilatation in the upper urinary tract was already well established. On the other hand one of the eight-year survivors is now the happy mother of 2 children, one having been delivered by Cæsarean section three years after the transplantation. She is incidentally a patient who had a simultaneous transplantation of 3 ureters, that on the left being duplicated (Figs. 8 and 9).

An earlier paper of mine described 3 out of 44 ureteral transplantations associated with duplicated ureters on one side (*Brit. J. Urol.* (1946) **18,** 1). This patient was one of these 3. In the subsequent 94 patients operated on since that publication, a duplicated ureter has been met with on only one other occasion.

TABLE VII.—URETERO-INTESTINAL ANASTOMOSIS FOR TRAUMA

Vesico-vaginal Fistula 22

Operative mortality 3
- 1 in 3 days from ileus
- 1 „ 6 „ „ peritonitis
- 1 „ 14 „ „ suppurative nephritis

Short post-operative survival 4
- 1 in 31 days: acute pyelonephritis subsequent to enema
- 1 „ 2 mths: cause unknown (single kidney)
- 1 „ 3 „ subsequent to nephrectomy for fistula
- 1 „ 8 „ subsequent to operation for intestinal obstruction

Survived 7 years 1 (died in uræmia)
„ 17 years 1 (died after operation for malignant pancreas)
Untraced 1

Alive:

Under 1 year	1	12	for 9 years	1	
for 5 years	2		„ 10 „	1	
„ 6 „	1		„ 11 „	2	
„ 8 „	3		„ 14 „	1	

TABLE VIII.—URETERO-INTESTINAL ANASTOMOSIS FOR TRAUMA

(other than vesico-vaginal fistula)

No. of patients		4
Died in 2 months	1	
Alive:		
18 months	1	
39 „	1	
11 years	1	

TABLE IX.—URETERO-INTESTINAL ANASTOMOSIS FOR CONGENITAL ANOMALIES

No. of patients		4
Operative mortality	1	
Alive:		
18 months (exstrophy)	1	
7 years (epispadias)	1	
11 „ (subsymphyseal exstrophy)	1	

Of the remaining 4 patients in the trauma group, 3 were females and 1 male. 2 of the females, 15 and 19 years of age, had been incontinent since injuries received in infancy, the first from a fall astride and the second as the result of a run-over accident. The third female patient suffers from disseminated sclerosis, but has been included in the trauma group for urinary incontinence followed a perurethral resection of the bladder neck performed for the relief of retention. She gradually lost rectal control and fifteen months ago, that is two years after the implantation, a wet colostomy was established.

FIG. 8.

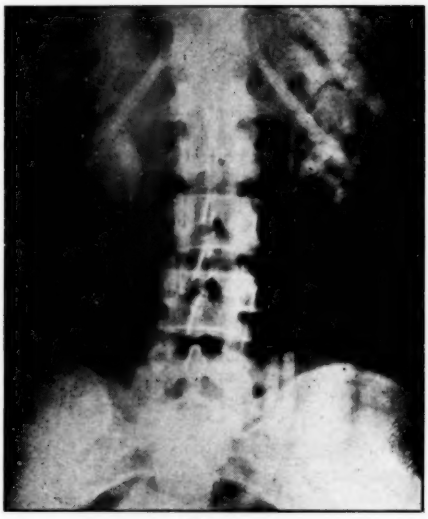

FIG. 9.

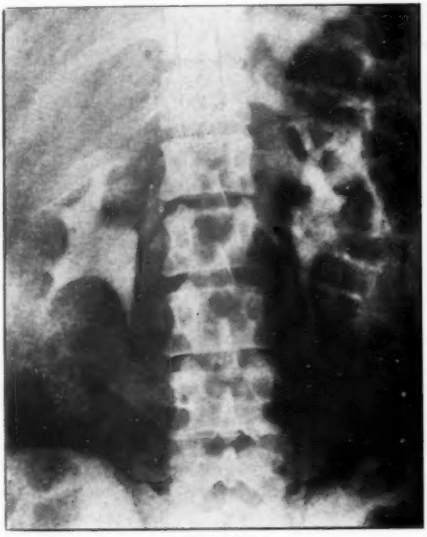

FIG. 10.

FIG. 8.—Intravenous urogram taken during sixth month of pregnancy, three years after a simultaneous transplantation of 3 ureters by the Coffey No. 1 technique. (The left ureter was duplicated.)

FIG. 9.—Intravenous urogram (same case as Fig. 8) eight years after operation.

FIG. 10.—Intravenous urogram eleven years after uretero-intestinal anastomosis by the Coffey No. 1 technique for incontinence due to sub-symphyseal vesical exstrophy.

The male patient sustained a ruptured urethra associated with multiple fractures of the pelvis as a result of being run over after falling from his bicycle. When he came under my care four years later in 1940, he was then aged 22 and in a miserable state with a suprapubic tube which was not watertight, urine leaking from two sinuses on the inner left thigh, and a large branching calculus in the left kidney. Between the base of the scrotum and the anal orifice a stone-like mass of fibrous tissue surrounded and blocked the urethra. A re-establishment of the urethral canal was quickly followed by further contracture and occlusion. Finally the right ureter was transplanted and twenty-four days later a left nephrectomy was carried out. Now eleven years later he remains well and works as a glass polisher (*see* Table VIII).

(*d*) *Congenital anomalies.*—Of the 4 patients in this group 3 were adults, the other being the child of 6 mentioned at the outset of this paper. Table IX indicates the nature of the anomaly and the longevity following transplantation in the 3 adults (*see* Fig. 10).

Summary

The results of uretero-intestinal anastomosis on 138 patients have been surveyed. The operations have been carried out over a period of approximately two decades though about 80% of the total were performed in the last ten years, and 58% in the last five years. The long-term or end-result in all but one patient has been ascertained. The operative mortality has been around 13% even for patients who might be considered good risks, this being the figure for those operated on for vesico-vaginal fistula. The same figure pertains for the tuberculous sufferers though the more recent mortality rate in this group has been reduced to 5%. Mortality in the malignant group for transplantation alone was 10%; when combined with or followed by cystectomy it was more than doubled. Patients with congenital anomalies who had reached adult life before coming to operation seemed to present the least risk but my figures for this group are too small to be of statistical significance.

In the last 50 consecutive operations there were 4 deaths in the malignant group which numbered 26 and included 18 cystectomies. In the non-malignant groups numbering 24 there were 2 deaths. Contributory factors to an improvement in immediate results in recent years is the availability of chemotherapy, which enables amongst its other benefits a near-sterilization of the lower bowel before operation; an increase in the knowledge of water and electrolyte balance and in the requirements of the patient after transplantation; and the use of supportive treatment, particularly blood transfusion for the debilitated subject.

As regards longevity after operation, there are 25 patients who lived or still survive for five years and over. Of these, 6 suffered from vesical tuberculosis and 3 from non-tuberculous vesical contracture; 13 had vesico-vaginal fistulæ and 1 a urethral injury; 2 had congenital anomalies. 7 of the 25 are alive for periods of ten to fourteen years and 1 now deceased as a result of an intercurrent disease lived for seventeen years.

Conclusion

Deviating the urine from the bladder by implanting the ureters into the pelvic colon is a serious undertaking associated with immediate risks and possible future morbidity. Nevertheless, following a successful operation, a comfortable normal-like social life can be followed and work with gainful employment becomes possible. The urinary diversion is compatible with a long life-expectancy, this being influenced by the nature of the lesion necessitating the transplantation rather than by the transplantation itself. Whatever the underlying lesion may be, the operation is performed for the assuagement of symptoms ofttimes associated with mental anguish as well as physical suffering, which may on occasions reach a stage hardly to be borne. In these circumstances uretero-intestinal anastomosis should be advised as the way of bringing relief and rehabilitation.

[*November* 22, 1951]

The following **Cases** and **Specimens** were shown:

Fibrosarcoma of the Kidney.—Mr. Richard A. Mogg.

Papilloma of Renal Pelvis.—Mr. R. H. O. B. Robinson.

Mesenchymoma of the Kidney.—Mr. B. E. C. Stanley.

Kidney and Double Ureter, with Ureterocœle and Multiple Calculi.—Mr. J. P. Hopewell.

Occult Chorionepithelioma of Testis with Abdominal and Thoracic Secondaries.—Mr. Stephen Power.

X-ray Films of ? Silver Testicle.—Mr. Alex. E. Roche.

Chronic Torsion of Spermatic Cord with Secondary Hydrocœle and Testicular Atrophy.—Mr. J. Sandrey.

(1) Rhabdomyosarcoma of the Bladder in Childhood. (2) Four Total Cystectomy Specimens and Photomicrographs, &c., of Two Further Cases.—Mr. T. Twistington Higgins (introduced by Mr. D. I. Williams).

Glass Rod in Urethra.—Mr. J. A. S. Green (introduced by Mr. A. W. Badenoch).

Urethrograms Showing Reflux into the Vas and Seminal Vesicle.—Mr. T. L. Chapman.

(1) Diverticulum of Bladder Containing Multiple Calculi in Association with Adenomatous Prostate. (2) Diverticulum of Bladder Associated with Adenomatous Enlargement of the Prostate. (3) Diverticulosis of Bladder Associated with Carcinoma of Prostate.—Mr. L. N. Pyrah.

Congenital Obstruction at the Bladder Neck.—Mr. Edgar Freshman.

Contracted Bladder and Bilateral Hydro-ureter due to Abacterial Pyuria.—Mr. J. A. Russell Johnson.

Section of Proctology

President—CLIVE BUTLER, F.R.C.S.

[*November* 14, 1951]

Some Observations on the Treatment of Carcinoma of the Rectum

PRESIDENT'S ADDRESS

By CLIVE BUTLER, F.R.C.S.

IN this Address I propose to review the treatment of 267 cases of rectal carcinoma which have been under my care at the London Hospital during the past ten years; most emphasis will be placed on the immediate and late results of synchronous combined excision of the rectum for carcinoma, but a report on sphincter-saving operations will also be given, since it is important that the outcome of as many of the latter procedures as possible be published so that their value can be assessed: the problem of local recurrence is of major importance to all who carry out these operations and any experience in this connexion may be valuable to others even if the number of cases is small.

DEFINITION

A definition of the term rectal cancer is first required since the dividing line between a growth of the upper rectum and the lower pelvic colon is notoriously difficult to determine; some go by the relation of the ulcer to the peritoneal reflection, others by its distance from the anus as determined by the sigmoidoscope. Both these criteria vary considerably in different people, so that in this paper neoplasms have been classified as carcinomas of the rectum, if their surgical removal would have necessitated mobilization with subsequent partial or complete removal of that part of the bowel which lies below the peritoneum. Operations for cancer of the large bowel in which the rectum proper was not disturbed have not been included.

Tables I and II show the methods of treatment which have been adopted with the immediate mortality.

TABLE I.—PALLIATIVE OPERATIONS

Type of operation	Numbers	Mortality
Colostomy	43	13 (30%)
Laparotomy	3	0
Diathermy	3	0
No treatment	6	0
	55	

TABLE II.—RADICAL OPERATIONS

	Numbers	Mortality
Hartmann's	24	3 (13%)
Anterior resection	24	2 (8%)
Perineal excision	4	0
Abdomino-anal anastomosis ..	2	0
Pull-through	4	2
Synchronous combined excision	154	11 (7%)
	212	

PALLIATIVE MEASURES

The number of advanced cases of rectal cancer admitted to a large general hospital is possibly higher than at a special hospital such as St. Mark's; this may account for the number of patients who had a palliative colostomy. The operation was only carried out when the local or general condition of the patient prevented excision of the growth. Many of these patients were in a very poor state with advanced obstruction and carcinomatosis; the majority of the deaths was from termina!

bronchopneumonia. In our view, palliative colostomy should, as a rule, be performed only when the carcinoma is irremovable and the patient has definite symptoms of intestinal obstruction. The performance of a colostomy alone has little effect on the symptoms of the ulcer, since bleeding and rectal discharge continue, and we believe that excision, preferably with preservation of the sphincters, should be done on as many advanced cases as possible even if they are clinically incurable. In the last 60 cases admitted under my care, colostomy has been performed eight times; the remainder had the rectum excised.

An increased rate of resection should not be confused with a greater rate of cure, but the former figures indicate that a large number of people are now made more comfortable for a time because their primary growths have been excised. In a few cases when excision has been impossible, diathermy to the ulcer has given temporary relief.

Radical Operations

I should like first to consider Hartmann's operation. For those who are unfamiliar with this procedure, the operation consists in removing the pelvic colon and a variable amount of the rectum. The anal canal and the terminal part of the rectum are left in situ and a permanent colostomy is performed in the left iliac fossa. In this operation we have not closed the rectal stump, but have used it as a convenient place through which to put a tube to drain the presacral space after re-formation of the pelvic peritoneal floor.

In the past this operation was reserved for cases where the ulcer was above the peritoneal reflection; it could be carried out more quickly than an abdomino-perineal excision; there was less shock and the convalescence was usually smoother and quicker than after a complete operation.

Many surgeons have completely abandoned this operation for two reasons: firstly, because of recurrence in the rectal stump, and secondly, because of the introduction and adoption of procedures to restore continuity of the bowel. We still find it a useful method in an elderly patient with a high growth when an abdomino-perineal seems unnecessary and if the condition of the patient or the length of bowel available renders an anastomosis impracticable.

The results of this operation are seen in Table III. 9 patients were operated on five or more years ago with 2 operative deaths; of the remainder, 4 are alive and well to-day; 3 of these were early cases,

Table III.—Results of Hartmann's Operations

Year	A cases	B cases	C cases	Alive in 1951
1942		1		0
1943		1		1
1944	1		1	1 (A)
1945	1	1		1 (A)
1946	2		1	1 (C)
1947	1	2	4	3 (1 of each grade)
1948				
1949	1	1	1	1 (A)
1950	1	2	1	2
1951			1	1

Note.—A cases: growth confined to the bowel.
B cases: growth had invaded peritoneal coat.
C cases: growth had invaded glands.

1 had glandular involvement. 2 patients have developed recurrences in the rectal stump; both have died. This series is too small for any statistical analysis, but it is probable that this operation still has a small but definite place in the treatment of rectal cancer.

Anterior Resection

This is probably the most popular operation in this country for preservation of the sphincters, since successful cases have perfect sphincter control—which is not always so with other types of conservative operations. Our indications for this operation have been:

(1) A mobile growth above the peritoneal reflection when we have thought it unnecessary to perform an abdomino-perineal excision.

(2) As a palliative procedure in advanced cases so as to avoid a colostomy and to enable the primary growth to be removed.

This operation has not been performed for any growth which extends below the peritoneal reflection or if there is wide involvement of the peritoneal floor, retroperitoneal tissues or adjacent viscera.

The following points are important:

(1) A final decision in favour of an anastomosis should not be made until firstly the rectum has been

thoroughly mobilized, secondly the descending colon freed, if necessary, by mobilizing the splenic flexure, and thirdly, the inferior mesenteric artery has been ligated at the highest points requisite for a radical excision of the growth and lymphatic field. If there is insufficient viable bowel left for an anastomosis, then an abdomino-perineal or Hartmann's excision should be carried out.

(2) The anastomosis should be performed in two layers without tension; the site should always be drained because a certain amount of leakage is almost inevitable.

(3) The peritoneal floor should, if possible, be re-formed above the anastomosis, as this forms a useful barrier against infection.

(4) It has always been my custom to perform a temporary transverse colostomy at the time of the operation unless performing a palliative resection.

Many authorities state that a colostomy is not needed and it is true to say that it is possible to carry out a large number of these operations successfully without a colostomy, but occasionally leakage will occur which may prove disastrous if the fæcal stream has not been diverted.

Pre- and post-operative chemotherapy has made this operation a very safe one, but too much trust should not be placed in its powers, particularly if the proximal large bowel has not been completely emptied by pre-operative treatment.

The results up to date are as follows: In 4 cases a palliative resection was performed; 1 of these patients died from peritonitis. In the remaining 20 cases (Table IV) there was 1 death from a

TABLE IV.—RESULTS OF ANTERIOR RESECTIONS

Year	A cases	B cases	C cases	Alive in 1951
1947			1	0
1948	1	1	1	3 (1 local recurrence)
1949	1	1	2	0 (1 at operation) (1 no recurrence)
1950		1	3	4
1951	3	1	4	8

pulmonary embolus; 2 patients have developed a recurrence at or near the suture line; 1 has died and the other has survived three years after the recurrence was removed by diathermy two years ago.

Local recurrence in anterior resections.—The incidence of local recurrence is one peculiar to operations on the rectum and it is surely due to one of the following causes:

(1) Excessive handling of the bowel during mobilization of the rectum.

(2) Imperfect cleaning of the rectum before anastomosis, with subsequent implantation of cancer cells.

(3) Cutting through the rectum too near the growth.

I think that the last factor may well be the most important one; in our experience there has rarely been any temptation to preserve too much of the pelvic colon, but it is very easy to divide the rectum too high in order to facilitate an easier anastomosis. I believe that this temptation is one of the most serious objections to this operation.

Local recurrences are unusual in pull-through or abdomino-anal operations; in both these procedures excessive manipulations are carried out, but in the end more rectum is removed and the danger of local recurrence seems to be less than in the intra-abdominal anastomoses.

Until the dangers of local recurrence are reduced, anterior resection should not be accepted as a routine procedure for rectal cancer, although it is one which has a very definite place in the treatment of high growths.

Perineal Excision

I have had little experience in perineal excision; 3 of the 4 patients are now dead from recurrence; 1 has survived three years. This procedure has no advantage over the radical excision as it is no less hazardous and is far less radical.

Abdomino-anal Anastomosis

This operation was only carried out twice, once as a palliative resection and once as a formal excision. The latter patient is well after two years but has little sphincter control. It is probable that this operation is the most radical sphincter-saving procedure provided that adequate mobilization of the colon can be achieved.

Pull-through Operation

2 out of the 4 patients on whom a pull-through operation was carried out died from sloughing of the colon; the 2 survivors are interesting. One was a man aged 82 who survived three years before dying of liver metastasis; the pelvis was clear at post-mortem. The other was a lady aged 76 who

is alive and well four years later at the age of 80. This operation seems to be well tolerated by the aged, but has necrosis as a special danger. Doubtless with experience this complication would tend to disappear.

Combined Excision of the Rectum

In 1939 Mr. Hermon Taylor and I started to perform synchronous combined excision of the rectum for cancer shortly after Mr. Lloyd-Davies' description of this operation from St. Mark's Hospital (Lloyd-Davies, 1939). Since that date we have carried out 154 excisions; 123 of them have been done by Mr. Hermon Taylor and myself and 31 by my first assistant and myself. At first we had a succession of anæsthetists, but during the past few years we have included in our team first Dr. B. Kenton and then Dr. A. I. Parry Brown and Dr. S. D. K. Stride.

Since the technique we now use differs in certain aspects from that carried out at St. Mark's Hospital, we propose to discuss at some length certain features of this operation which we hope may be of general interest.

The advantages of this method may be summarized as follows. The patient does not have to be moved during the operation; this lessens shock and saves time. When the growth is a large one with peri-rectal induration a single operator often has difficulty in determining the tissue planes between the growth and such structures as the bladder or prostate. With two surgeons each can help the other to identify these important landmarks and each can indicate to the other the appropriate lines of cleavage. In this way the operability rate can be raised, as more formidable growths may be tackled with confidence.

This method is also valuable when adjacent viscera have to be removed, since very large excisions can be performed with a minimum of disturbance or blood loss. Furthermore this is an excellent operation for training assistants in the technique of rectal excision. The trainee can in turn be entrusted with the abdominal or perineal phase of the operation while under the direct supervision of his senior partner.

Although the main value of the lithotomy Trendelenburg position is in excision of the rectum, it is also useful in sphincter-preserving operations, notably anterior resection or abdomino-anal anastomosis. In these cases the assistant at first stands between the abducted legs and retracts the bladder or uterus; later on he can prepare the rectum or anal canal for anastomosis without disturbing the patient or the abdominal surgeon. This position is also useful in operations for complete rectal prolapse when a combined attack is made on the prolapse from the abdomen and the perineum.

The apparatus needed.—Proper leg irons are essential; the pattern used at St. Mark's Hospital has proved satisfactory. These instruments can be fitted to any standard operation table. The supports can be adjusted to any height and the degree of abduction of the legs and thighs may be altered by means of ball and socket joints. It is useful to have a rubber pelvic support clamped to the end of the table, as devised by Goligher, but in its absence a sandbag provides an efficient substitute.

Pre-operative treatment.—Patients should be admitted to hospital for about one week before operation; they are not, of course, confined to bed.

In addition to the usual investigations before a major rectal operation, special care should be devoted to the elimination of sepsis from the bowel. Many cases of rectal cancer are infected and in some instances the infection has spread into the surrounding cellular tissues.

A routine course of one of the insoluble sulphonamides should be given for five days before operation; in addition we also give a daily injection of vitamin K in order to prevent any possibility of intestinal hæmorrhage. 2 cases of this nature have been seen at the London Hospital, one of which was fatal.

If the patient is sensitive to sulphonamides, we give a two-day course of streptomycin orally; this drug should not be given for a longer period before operation or the intestinal bacteria may become streptomycin resistant. We have, so far, not found it necessary to resort to Chloromycetin, Aureomycin or Terramycin, since they are expensive drugs and in America their value is not considered to be any greater than that of the sulphonamides in pre-operative therapy.

If the patient has any fever or clinical evidence of perirectal induration, penicillin therapy should also be administered for a similar period in the hope of diminishing the infection.

In addition, skilled instruction should be given in breathing exercises, which are most valuable after the operation but the patients must know beforehand how to carry them out.

Anæsthesia.—The main problem in the successful management of these cases is the regulation of blood pressure both during and in the immediate post-operative phase. Although the age incidence of the disease is wide, many of the patients are elderly and unable to tolerate a prolonged fall in blood pressure. Consequently the anæsthetist's problem is to ensure a small drop in blood pressure during the active part of the operation and to provide a satisfactory level relative to the patient's normal reading at the end of it.

We have found that attention to the following points helps us to maintain these ideals:

Firstly: The fall due to blood loss is controlled by blood replacement from the commencement of the operation with an intravenous transfusion.

Secondly: In dissection of the rectum and colon disturbances of the circulation from stimulation of the autonomic ganglia underlying the pelvic fascia are almost unavoidable as traction on this layer cannot be cushioned by extreme muscular relaxation, as can traction on mesenteries in the upper abdomen. Consequently,

some form of nerve block is the ideal method to prevent a reflex fall in blood pressure, and this we obtain by a medium spinal analgesia.

Thirdly: Minimizing movement of the anæsthetized patient is a great help and in the combined lithotomy Trendelenburg position the operation can be completed without changing the position of the patient. As this position is not easily tolerated by a conscious patient, a light general anæsthetic is given, which is achieved with thiopentone and the anæsthesia continued with nitrous oxide and oxygen in the ratio of 60 to 40. Under the narcosis light nupercaine 1 : 1,500 is injected intrathecally between L.3 and L.4 vertebræ with the patient in the right lateral position. A maximum dose of 6 ml. is given according to size and the patient turned on to the prone position with 10 degrees Trendelenburg tilt for five minutes and then fixed in position on the table.

Whilst the legs are being adjusted the blood transfusion is started.

In the majority of patients this dose of 6 ml. produces a block to T.10, if not higher, and allows the greater part of the surgery to be completed without the transmission of powerful stimuli. If the upper abdomen is not adequately relaxed when the surgeon wishes to explore the liver for secondaries, then a minimum amount of pentothal will provide adequate facilities. On the other hand, in the rare case when the spinal anæsthetic is not sufficiently high, curare will provide the necessary relaxation.

Finally, spinal analgesia *per se* will cause a fall in blood pressure if the thoracic sympathetic outflow is blocked. This is avoided to a great extent by the minimal dose used. Such fall in pressure that does occur is easily regulated by intravenous methedrine—6 mg. as an initial dose and 3 mg. at a time for additional doses. With a maximum dose of 15 mg. of methedrine we have always been able to provide a reasonable blood pressure for suture of the perineum.

Although many anæsthetists have been obtaining adequate results with much simpler techniques, namely by a sequence of pentothal, nitrous oxide, oxygen and *d*-tubocurarine chloride, we have felt justified in carrying on with our more involved method as our patients have maintained a very even post-operative course with a minimum of chest complications, but we shall from time to time try fresh methods in order further to improve our results.

Position on the table.—When the patient has been anæsthetized he must be arranged on the table (Fig. 1). The shoulder pieces must be tested so that it is impossible for him to slip downwards during the operation. The right arm is abducted to receive the blood transfusion, which is commenced at the beginning of the operation, so that an immediate supply of blood is available in case of unexpected hæmorrhage or collapse. Normally two pints are required but more should be ready in case of need.

FIG. 1.—Position of patient on operating table for synchronous combined rectal excision.

Diathermy should be available should bleeding occur from the pre-sacral veins, which sometimes happens when the growth is adherent to the sacrum.

The incision.—There are two possible incisions. One is the lower left paramedian incision, with a stab wound for the colostomy over the left iliac fossa. The other is the left lower oblique incision extending from the pubes immediately lateral to the rectus tendon, upwards and outwards along the curve of the rectus muscle and diverging laterally in its upper part across the transversus and internal oblique muscles. The upper and outer inch or so of this incision will accommodate the colostomy at the end of the operation. It was our practice for a long time to use the paramedian incision following Miles' original description, but we have largely abandoned it in favour of the oblique incision which gives a more direct approach to the congenital membranes which bind the colon to the iliac fossa.

The peritoneal flaps.—Deep in the hollow of the pelvis there is an adequate amount of peritoneum available to reconstitute the pelvic floor after removal of the specimen, but higher up difficulty may arise in covering the promontory of the sacrum and in securing an adequate closure of the peritoneum just below this point. This consideration must be borne in mind while fashioning the lateral peritoneal flaps. One has little choice on the left side except to take care not to sacrifice any lateral peritoneum by careless separation of the congenital membranes while the colon is being mobilized from the left iliac fossa. On the right side, however, there is a broad expanse of peritoneum from the right

iliac fossa up the right side of the pelvic mesocolon which can be utilized to cover the prominent sacrum. The incision which demarcates the right peritoneal flap therefore passes from the depths of the pelvis anteriorly, ascending laterally round the right wall of the pelvis to the root of the mesocolon below the level of the sacral promontory, and then mounting up the breadth of the mesentery before curving once more down towards the mid-line. The delicate peritoneal flap outlined is gently raised by a combination of sharp and blunt dissection until it is mobilized as far as the right iliac fossa, while below it is lifted away from the side of the pelvis (Fig. 2). It will be found that the ureter adheres naturally to the underside of this flap where it need not be disturbed. The peritoneal incision is carried similarly round the left side of the pelvis and a flap is raised conserving as much of the lateral peritoneum as possible. It is important that both flaps should be fully mobilized from the walls of the pelvis and iliac fossæ at the beginning of the operation; it is too late to repair this omission when the suturing of the pelvic floor is half completed and the sutures begin to cut out.

FIG. 2.—Showing extent of peritoneal flap on right side during the abdominal phase of combined excision of the rectum.

Formation of the colostomy.—In 1946, at Mr. Hermon Taylor's suggestion, we began the practice of sewing the colon to the skin at the end of the operation, and I am grateful to him for this description of his technique. The abdomen is closed below the stump of the colon, which still bears its clamp. No sutures are placed between the bowel and the deepest layers of the abdominal wall, as they are unnecessary and predispose to deep infection round the colostomy. The layers are sutured together from below as far as the colon, which is enclosed sufficiently loosely to allow a finger to pass alongside it without force. When the skin has been closed, a waterproof dressing is applied to the wound below. The colostomy and the area are dressed with penicillin-sulphonamide powder. Tissue forceps are applied to the colon, the clamp is removed and a small swab with a tape attached is put into the lumen to control the contents while sutures are placed between the skin and the end of the bowel. These are passed in such a way as to roll out the edge of the bowel so that the edge of the mucosa lies to the edge of the skin, while a considerable collar of bowel projects above the surface. The method is illustrated in the diagram (Fig. 3). Each stitch enters the skin half an inch from the wound and emerges at the skin edge itself. It then passes through the edge of the bowel wall from mucosa to serosa and pierces the colon again from serosal aspect an inch proximally, finally emerging from the depths of the lumen. As the suture is tied the bowel wall is drawn out on to the surface of the skin while its edge is tucked under. Five or six such stitches produce a final effect like a sea-anemone,

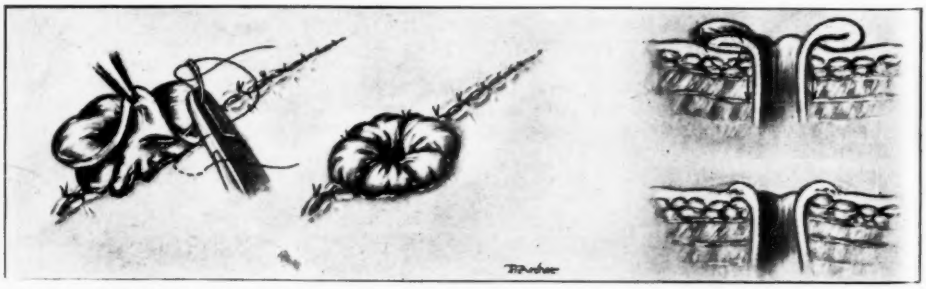

FIG. 3.—Method of stitching colostomy to the skin which avoids stenosis and retraction. (For details *see* text.)

which is covered with an oily dressing after removal of the occluding swab. This method provides an immediate free vent for escape of gas and fæces, primary healing occurs between skin and mucosa and the colon is held in an elastic way which accommodates any retraction that may occur. Infection is uncommon and we have had no serious trouble with this method of colostomy since we first used it six years ago.

Where the colostomy has been previously established for intestinal obstruction it will of necessity be of the "spur" type. At the second stage it is important not to be satisfied with section and closure of the colon beyond the spur, retaining this as a permanent arrangement. Fæces would collect and become inspissated in the blind distal stump of colon and give rise to irritation and infection with recurrent pain and trouble with the colostomy. It is important to secure an end colostomy, and this can best be done by excising the temporary colostomy with the specimen and making a new end colostomy by drawing down the colon a little further. The alternative plan of turning the distal stump of the colon inside out and cutting it off is more difficult to do, is apt to give rise to bleeding from the mesentery and often results in a misshapen colostomy opening with a recess where fæces may lodge.

Perineal phase.—The surgical anatomy of the perineal part of this operation has been fully described by Mr. C. Naunton Morgan (1949). His paper should be studied by all who are interested in this procedure.

The rectum is first gently cleaned out and lightly packed with gauze. The packing distends the rectum slightly and makes it less likely to be injured during the perineal dissection. The anus is then closed with a purse-string suture of silk which is left long for traction.

The incision is at once deepened posteriorly for the removal of the coccyx. It is now possible to insert a finger on either side of the mid-line above the ileo-coccygeus portions of the levator ani muscles. These, together with the ischiorectal fat and inferior rectal vessels should be divided as far laterally as possible. A self-retaining retractor may then with advantage be inserted.

At this stage the abdominal surgeon passes his hand down behind the rectum in front of the pre-sacral fascia of Waldeyer. His fingers put on stretch the attachment of this fascia to the posterior part of the ano-rectal junction. This attachment should be divided transversely by the perineal dissector. This step will free the whole of the rectum posteriorly (Fig. 4).

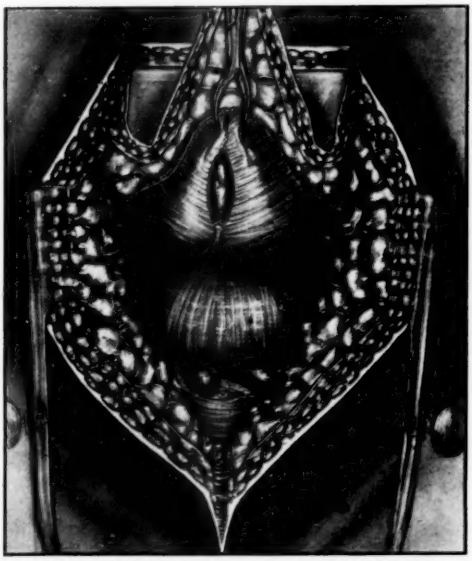

FIG. 4.—Division of the presacral fascia of Waldeyer during the perineal dissection. Note the abdominal operator's fingers protruding through the incision in the fascia.

It is imperative that the pre-sacral fascia be divided in the right plane. If the dissection is carried out behind this fascia hæmorrhage may occur from a plexus of veins going into the sacrum; furthermore post-operative retention is apt to persist from interference with the hypogastric plexus.

The anterior part of the wound is then deepened until the transverse perineal muscles are seen. Next the pubo-coccygeus muscles are divided as they run in a strap-like manner along the side of the rectum. When these muscles have been divided it is possible to palpate the groove between the prostate and rectum. Carrying the anterior dissection deeper, the diverging fibres of the recto-urethralis muscle can be seen; these should be cut transversely. A blunt hæmostat may then be introduced between the rectum and the prostate which opens up the fascial space of Denonvilliers. This space may occasionally be difficult to determine from below, but in these cases the correct plane can at once be demonstrated by the abdominal surgeon. In this way injury to the rectum or prostate may readily be avoided and the two surgeons should meet anteriorly at the lowest limit of the recto-vesical pouch. Lastly the lateral ligaments of the rectum have to be cut; these are often thick and may be the seat of carcinomatous infiltration; they should be divided as far out as possible. The whole specimen is now free and may be delivered through the perineum.

Treatment of the Perineal Wound

The cavity should be swabbed out with hot packs and all bleeding points controlled by ligation or diathermy. Before attempting to close the perineal wound it is generally necessary to rotate the thighs inwards so that the tension on the perineum can be diminished; this may be done by loosening the appropriate joints on the leg supports.

If the patient's systolic blood pressure is 100 or over, it is usually safe to sew up the wound completely save for a rubber drain posteriorly. When the pressure is low, or if there is still oozing, the wound ought to be packed; failure to do this may result in a serious reactionary hæmorrhage. We have always used sterile oiled silk reinforced with rolls of gauze. The pack is brought out of the posterior part of the wound, the remainder being sewn up.

Post-operative Treatment

The pack, if present, is loosened at the end of forty-eight hours and removed on the third day. Afterwards the wound is irrigated daily until the patient gets up, when a daily bath replaces the wash-out. After irrigation the wound should be lightly packed with gauze. When the perineal wound is stitched up, the stitches are removed ten days after operation; no other treatment is then required.

The catheter is removed on the fifth day; in certain cases it may need to be reinserted if the tone of the bladder has not returned.

From the beginning the patient is encouraged to move about in bed and to take regular leg and breathing exercises. We do not consider early ambulation is essential provided that adequate exercises are performed; indeed getting up too soon may cause the perineal stitches to pull out when the patient sits down.

We have had one death from pulmonary embolus, in 1940 before our post-operative routine was established; femoral vein ligation has so far not been required.

Operations in Women

The same procedure is carried out, but if the growth is on the anterior rectal wall then the posterior vaginal wall should be removed in order to prevent vaginal recurrences. No attempt is made to sew up the posterior vaginal wall, but if the wound is packed the packing is brought out through the vagina and the perineal wound is sewn up. Sterilization should be performed in all cases if the woman is of child-bearing age; we have had one patient who became pregnant and had a successful Cæsarean section at full term. She is so far well, but this is an experience which should not be allowed.

Treatment of Advanced Cases

Men.—In the male with advanced growths on the anterior rectal wall we have removed the vesicles, part of the bladder and a slice of the prostate. The late results of these operations have been disappointing and in the future we shall have to consider the work of Appleby (1950), who advocates pelvic evisceration in these cases with transplantation of the ureters.

Women.—In women total hysterectomy with removal of part of the vagina has often to be carried out, since invasion of the uterus or vaginal vault is not uncommon. The combined method is very useful in these cases especially in the dissection around the vaginal fornices. Ligation of one or both of the anterior divisions of the internal iliac arteries may profitably be done in these operations, but care should be taken in elderly women, as bilateral ligation of these vessels may lead to sloughing of the base of the bladder with the formation of an intractable vesico-vaginal fistula. Unilateral ligation of the anterior division is, however, always safe; it should preferably be done on the side where the growth is most advanced.

Results

During the past ten years we have carried out 154 combined excisions, 86 males and 68 females. The majority of these operations have been done in one stage, preliminary colostomy being reserved for a few patients with intractable intestinal obstruction.

These patients were largely unselected, 15 of them were over 70, the oldest being 79 and the youngest 21. 11 patients died—a mortality of 7%.

Pathologically the specimens were graded according to Dukes' classification: 24% were Stage A, 41% Stage B and 35% Stage C. The follow-up records were as follows: 68 patients were operated on five years or more ago; they consisted of 14 A cases (9 of whom are alive and well (64%)), 34 B cases (5 of whom survive (15%)) and 20 C cases (with 4 survivals (20%)). In addition, 7 other patients died from other conditions and were found at post-mortem to have had no recurrence of their carcinoma. The times after operation varied from six to two years. The only A case to die from another cause is of considerable interest. In 1946 we carried out a right hemicolectomy and a combined excision for two separate carcinomata of the ascending colon and rectum. Both were Stage A. In 1951 he was admitted with an extensive primary "leather bottle" carcinoma of his stomach; I carried out an abdomino-thoracic gastrectomy, but he died two weeks later. Post-mortem showed no evidence of recurrences from his large bowel and the pathological report revealed a primary gastric neoplasm.

During the same period I have treated 45 cases of carcinoma of other parts of the large bowel by excision. They were comprised of 19 A (42%), 13 B and 13 C cases. 3 patients died, a mortality of 6·6%. 21 of these patients had their operation five years or more ago and so far 10 are alive (48%). 9 out of 14 A cases (64%), and 1 B case are alive; all the C cases are dead.

The late results of early cases of colonic cancer appear in this series to be similar to those of the rectum but the proportion of early cases is higher (42% compared with 24%) since obstructive symptoms often lead the patient to seek advice before the glands have become involved, or extra-colonic spread has occurred.

It would not be profitable to discuss cases operated upon less than five years ago but one may assume that the survival rates will be approximately the same as in the earlier series.

Another method of assessing the prognosis of rectal cancer has been on an anatomical basis, namely the relation of the ulcer to the lowest point of the peritoneal reflection. It has been stated that carcinomas above this reflection have a better prognosis than those below. This statement has to some extent been borne out in our series. 77 patients had a radical excision five or more years ago. In 61 cases the ulcer was below the peritoneal reflection; only 14 survived (18%). In 16 patients the ulcer was situated above the peritoneum and these cases were all included in this paper as their treatment required partial or complete removal of the rectum proper. 8 have survived (50%). One of the survivors in the second group was a C case, the others were A or B. The 8 deaths occurred in 3 A, 4 B and 1 C cases.

It is possible that the improved prognosis in this group is either due to earlier diagnosis, which is doubtful, or because lesions above the peritoneal reflection are less likely to invade secondary lymphatic channels or systemic veins. It is in this group also that sphincter-saving operations are commonly performed; in our small series none had this type of operation, but 9 had a Hartmann's excision, with 4 survivals, and 7 had an abdomino-perineal, with 4 living.

Before adopting whole-heartedly conservative resection of the rectum, we must therefore be certain that our five-year cures in early cases of high carcinomas are equal to those on whom a complete resection was performed. If this test fails, then we shall have to revise our ideas.

Follow-up of Advanced Cases

We thought it might be useful to review the survival of advanced cases, namely those in the male whose prostate was involved, and in the female where the uterus and vaginal vault were invaded. If these patients only survive a short time after their operations, then it might be argued that very extensive procedures in such cases were unjustifiable.

6 males had a routine excision of the rectum with partial resection of the prostate. 2 of these men are alive and well two years later; the other 4 died in periods between three to one year after their operations. It is possible that pelvic evisceration might have saved some of these 4 patients.

Ten women had an abdomino-perineal excision plus hysterectomy. 2 of them died from the effects of the operation; 3 are surviving after one year; the remainder died in periods from three to one year after their excisions. Although the expectation of life is not great after these operations, these patients often develop recto-vaginal fistulæ if left untouched, and it is probable that a radical excision is justifiable for that reason alone.

The reasons for death after rectal excision (Table V).—It is interesting to note that none was due to peritonitis, although a considerable number of these cases was operated on before the introduction of the insoluble

Table V.—Causes of Death after Combined Excision of the Rectum

1940	Pulmonary embolus.
1941	Pelvic cellulitis, injury to ureter.
1942	Pelvic cellulitis, injury to ureter.
1944	Acute intestinal obstruction.
1944	Cerebral thrombosis
1946	Reactionary hæmorrhage.
1946	Permanent bladder paresis, pyelonephritis.
1946	Acute intestinal obstruction.
1949	Hæmatemesis plus colonic bleeding.
1949	Paralytic ileus.
1950	Agranulocytosis.

sulphonamides. It makes one wonder if, in fact, these drugs are of great value in rectal excision, although their importance before anastomotic procedures is beyond doubt.

Taking the deaths in order of their occurrence, the only case of pulmonary embolus occurred before we had established a routine of post-operative exercises, but we are probably fortunate not to have had another fatal case. The 2 deaths from cellulitis were almost certainly due to injury to the ureter; these occurred early in our series and we hope will not be repeated. The 2 cases of obstruction might have been saved; one was from a Meckel's diverticulum, the other from an adhesion to the new pelvic floor. The patient with the reactionary hæmorrhage had her operation under a high spinal anæsthetic, so nowadays this misfortune should not recur.

The man with permanent bladder paresis was the only patient we have had whose bladder tone would not return. He finally died ten weeks after the operation from ascending infection of his kidneys. The growth in this patient was very adherent to the side wall of the pelvis and it is probable that the nerves to his bladder were irretrievably damaged during the operation.

The woman who died from hæmatemesis also had bleeding from the colostomy; no cause was found at post-mortem. We considered her bleeding might have been due to a vitamin deficiency following her chemotherapy; this complication should now be prevented by the routine administration of vitamin K.

The man with the paralytic ileus was a frail patient of 71; at post-mortem there was general distension of the intestine but no actual peritonitis.

Our last fatal case was in a woman of 71 who had a routine excision plus hysterectomy. She got up ten days later but developed cystitis and was given a further course of sulphonamides. A high fever developed, and examination of her blood revealed a complete absence of granulocytes and a total white count of 200. Despite penicillin, blood transfusions and pentose nucleotide she died two weeks later. There was no post-mortem.

Conclusion

During the same period 240 more cases of rectal cancer were treated by other members of the surgical staff, so that my total by no means exhausts the material available at the London Hospital.

The follow-up records show clearly that although the operative mortality for rectal cancer is very low, the ultimate results are disappointing. 77 patients had their operations over five years ago; 68 had an abdomino-perineal and 9 a Hartmann's resection. 61% of the A cases are alive, 16% of the B and 27% of the C patients. That is, 22 have been saved so far out of 77. These figures are very depressing, but for better results we must at the present time depend on earlier diagnosis; this can only come from the patients in the first instance and then early co-operation from our colleagues in general practice.

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